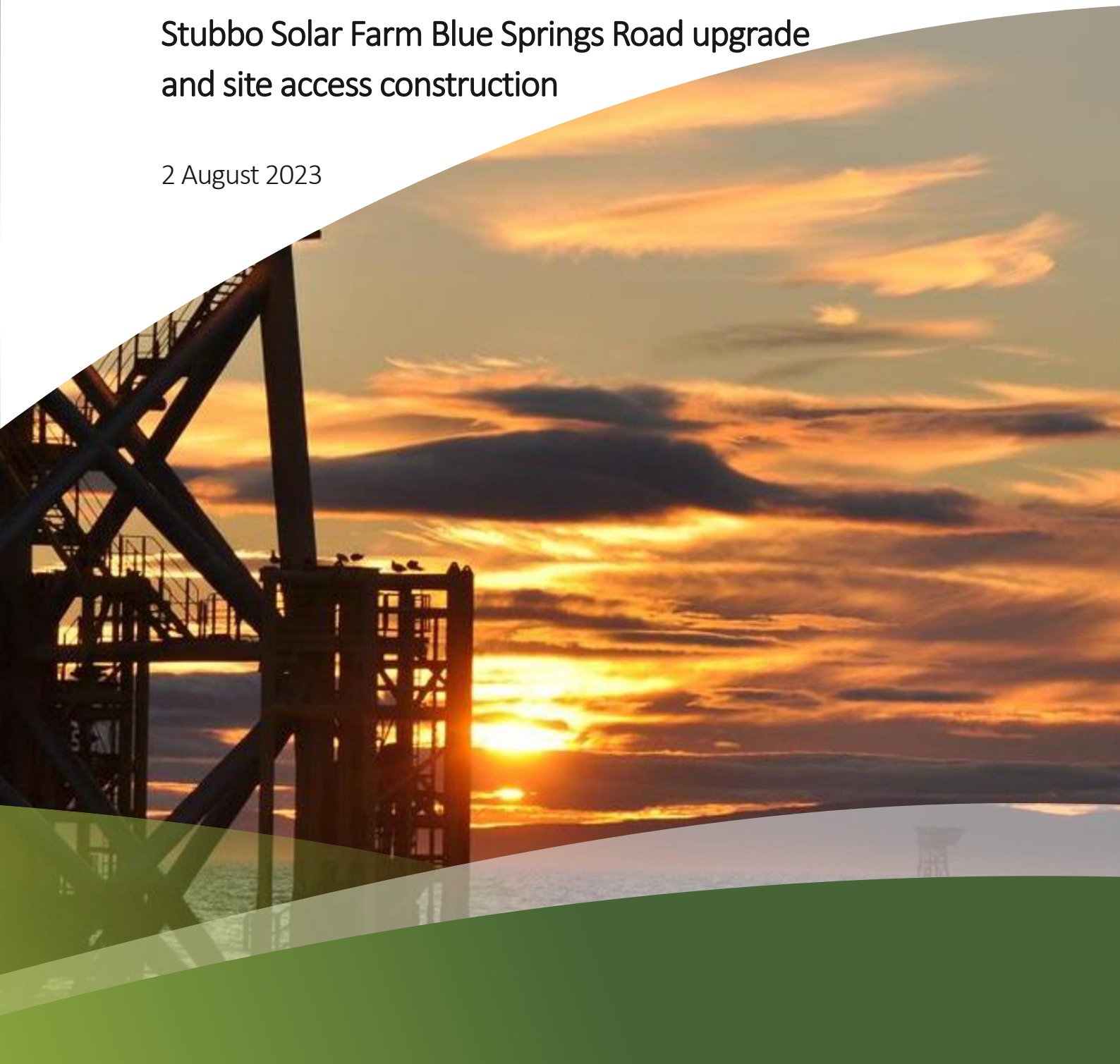
Soil and Water Management Plan

Stubbo Solar Farm Blue Springs Road upgrade and site access construction

2 August 2023



Soil and Water Management Plan
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Abbreviations

AC	alternating current
Accent	Accent Environmental Pty Ltd
ACEN	ACEN Australia
ACOR	ACOR Consultants
AHD	Australian Height Datum
BESS	battery energy storage system
BMP	Biodiversity Management Plan
BoP	balance of plant
CAA	Controlled Activity Approval
CCF	Civil Contractors Federation of Victoria
CoC	condition of consent
DC	development consent
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMP	environmental management plan
EMS	environment management strategy
EPC	engineering, procurement and construction
FC NSW	Forestry Corporation of NSW
HSE	health, safety and environment
km	kilometre
kV	kilovolt
LGA	local government area
MWRC	Mid-Western Regional Council
MW	megawatt
NSW	New South Wales
NSW RFS	NSW Rural Fire Service
POEO Act	*Protection of the Environment Operations Act 1997*
Ramboll	Ramboll Australia Pty Ltd
Stubbo Solar	Stubbo Solar Farm and Battery project
SWMP	Soil and Water Management Plan

TBD	to be determined
TfNSW	Transport for NSW
TMP	Traffic Management Plan
TTA	Traffic and Transport Assessment
UPC\AC	UPC\AC Renewables Australia Pty Ltd

1 Introduction

ACEN Australia Pty Ltd, (ACEN, formerly known as UPC\AC Renewables Australia) ACEN is developing the Stubbo Solar Farm and Battery project (Stubbo Solar), a grid-connected photovoltaic solar farm of up to 400 megawatts (MW) alternating current (AC) and a Battery Energy Storage System (BESS) of up to 200MW for 1 hour, in the New South Wales (NSW) Central West Orana region. The project is located approximately 90 kilometres (km) east of Dubbo, in the Mid-Western Regional Council (MWRC) Local Government Area (LGA).

ACEN is required under the development consent (DC) to upgrade of Blue Springs Road from its intersection with Cope Road to its intersection with the main site access. Simultaneously ACEN is also proposing to undertake construction of the main site access prior to commencement of construction of the Stubbo Solar project.

1.1 Purpose and scope of this document

The purpose of this Soil and Water Management Plan (SWMP) is to provide management controls for impacts that may occur during upgrade of Blue Springs Road and construction of the main site access works. ACEN engaged Accent Environmental Pty Ltd (Accent) to prepare the SWMP.

1.2 Strategic framework for environmental management of soil and water impacts

The SWMP provides the means by which ACEN and the Road Construction Contractor (the "Contractor") can manage project-related environmental risks by:

- systematically tracking and documenting compliance with DC conditions, environmental impact statement (EIS) and Amendment Report commitments, external regulatory requirements and internal policy obligations
- effectively communicating with external and internal stakeholders, including regulators, neighbours of Blue Springs Road, the broader community, contractors and company personnel achieving continuous improvement in environmental management.

The SWMP enables ACEN and the Contractor and subcontractors to meet environmental obligations and to implement environmental management best practices to identify, manage and mitigate soil and water-related environmental impacts during the upgrade of the Blue Springs Road and the construction of the main site access works.

The Environmental Impact Statement (EIS) was prepared by Ramboll (2020) and the Amendment Report also prepared by Ramboll (2021) in support of the Development Application (DA) for the Stubbo Solar project. This SWMP considers the findings and recommendations of the Amendment Report in addition to the findings of the EIS.

1.3 Project overview

The Stubbo Solar is an up to 400 MW AC solar farm development with a BESS. ACEN is the project owner. Energy will be generated through the conversion of solar radiation to electricity via photovoltaic modules (solar panels). The solar panels will generate direct current electricity that will be inverted to AC electricity via the use of power conversion units. The electricity output from the project will then be supplied to the existing 330 kilovolt (kV) transmission line (Line 79) operated by TransGrid.

The Development Consent (DC) - Application Number: SSD-10452 – requires the preparation, approval and implementation of an environmental management strategy (EMS) and subordinate environmental management plans (EMPs) for both construction and operations phases of the project, including a SWMP.

The focus of this SWMP is the works for the Blue Springs Road upgrade and for construction of the main site access.

The upgrade of the external roads and the construction of the main site access will be completed by the Contractor and the works will be managed in accordance with the Contractors Workplace Health, Safety and Environmental (HSE) Management Systems.

In meeting the specific environmental performance criteria established under the DC, ACEN will implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from construction activities.

It will be a requirement of the contract between ACEN and the Contractor, that the Contractor will carry out the construction:

- in accordance with the relevant conditions of consent (CoCs) in the DC
- generally in accordance with the EIS and the Amendment Report.

1.4 Project staging

In accordance with CoC 3 (Schedule 4) of the DC, ACEN has sought the Planning Secretary's discretion to stage the development and undertake construction of the main site access prior to completion of road upgrades, such that an upgraded access will be available into the site prior to the commencement of construction on site.

2 Statutory requirements

2.1 Key legislation

Key legislation used to develop this SWMP is listed in Table 2.1. The EMS presents and more fully describes additional legislation, guidelines and guidance materials of relevance to the environmental management of the solar farm.

Table 2.1 Key legislation

Abbreviated title	Document Name
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)

2.2 Development consent conditions

This SWMP has been developed to comply with the relevant DC conditions set out in DC Application Number: SSD 10452. The CoCs as they relate to soil and water management during construction are presented in Table A1 in Appendix A.

2.3 Commitments described in the Environmental Impact Statement

In addition to the CoCs, a number of commitments were made in the EIS and the Amendment Report (Ramboll 2021), and as these documents were the basis for DC, are commitments which must be adhered to. The commitments relevant to soil and water impact management during construction are presented in Table A2 in Appendix A.

2.4 Relevant policies, standards, guidelines and codes of practice

Additional policies, guidelines and guidance materials used to develop this SWMP are listed in Table 2.2.

Table 2.2 Relevant laws, policies, standards, guidelines and codes of practice

Document title
Managing Urban Stormwater –Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008)
Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018). Natural Resources Access Regulator, NSW Department of Industry. INT19/15607
Environmental Guidelines for Civil Construction, Civil Contractors Federation of Victoria, May 2010

3 Implementation and operation

ACEN, as the proponent and owner of the Stubbo Solar project has ultimate responsibility and accountability to ensure the project is designed, constructed, operated, upgraded and decommissioned in compliance with the approvals requirements.

Although ACEN has ultimate responsibility, a Road Construction Contractor will be engaged who will be contractually-obliged to manage these works in accordance with the consent. Therefore, most of the obligations in this SWMP will sit with the Road Construction Contractor.

All personnel working on the Stubbo Solar project are responsible for:

- reporting all environmental incidents to their supervisor
- carrying out work duties at all times in an environmentally sensitive and responsible manner.

Actions to achieve compliance during construction will be managed or undertaken by the Contractor and ACEN.

3.1 Key stakeholders

The stakeholders in the Stubbo Solar project include regulators, project stakeholders and community stakeholders. Table 3.1 lists the key stakeholders.

Table 3.1 List of key stakeholders

Regulators	Project stakeholders	Community stakeholders
Department of Planning and Environment (DPE)	ACEN	Stubbo Solar associated landholders
Mid-Western Regional Council (MWRC)	Road Construction Contractor EPC Contractor	Stubbo Solar sensitive receptors
NSW Rural Fire Service (NSW RFS)	Specialist subcontractors	Other neighbours
Department of Agriculture, Water and the Environment (DAWE) (Commonwealth)	Specialist consultants	Local business owners
Transport of NSW (TfNSW)	Transport and logistics companies	Local employers
SafeWork NSW	Project financiers/ investors	Local suppliers
Forestry Corporation of NSW (FC NSW)		Local employees
Transgrid		Local accommodation providers

3.2 Project organisational structure

Understanding the organisational structure of the project is important when it comes to understanding the roles and responsibilities of the various project stakeholders. During the specific construction works for the Blue Springs Road upgrade and for construction of the main site access, only a Contractor (or contractors) will be engaged, with no Balance of Plant (BoP) contractors engaged.

3.2.1 Applicant (Project Proponent)

ACEN Australia Pty Ltd (ACEN, formerly known as UPC\AC) is the Stubbo Solar Applicant and is the proponent of the project.

3.2.2 Contractor

The contractor/s will be engaged by ACEN. The Contractor for the Blue Springs Road upgrade may be MWRC. The Contractor has not yet been selected (i.e., is to be determined (TBD).

3.3 Roles and responsibilities

The project roles that ACEN has assigned to the project are briefly described below.

3.3.1 The ACEN Project Manager

The ACEN Project Manager role is to ensure the Blue Springs Road upgrade and construction of the site access is undertaken according to relevant CoCs of Development Consent SSD 10452. The ACEN Project Manager is accountable to ACEN senior management.

The ACEN Project Manager is also responsible for engaging consultants and contractors to do the detailed design work, completing the necessary construction, providing safety and environmental advice to the project team and engaging with the regulators and the community.

3.3.2 Contractor management team

The works will be constructed by a contractor (yet to be selected). The key Contractor roles are most likely to include a project manager, a HSE manager, a construction manager and a site manager. Their roles are described below.

Contractor Project Manager

The Contractor Project Manager is responsible for providing general support to the Construction Manager and the HSE manager and for ensuring the ACEN Project Manager is informed on all major project developments. The Contractor Project Manager is accountable to the ACEN Project Manager.

Contractor Health, Safety and Environment Manager

The Contractor HSE Manager is responsible for providing safety and environmental advice to the project team. He/she is in charge of implementation of all environmental, fire protection, and safety plans and for reporting non-conformances to the Contractor Construction Manager.

The Contractor HSE Manager is responsible for conducting daily site inspections. The Contractor HSE Manager is accountable to the Contractor Project Manager

Contractor Construction Manager

The Contractor Construction Manager is responsible for the general supervision and day-to-day coordination of works on the Project site. The Contractor Construction Manager is also responsible for ensuring all site works are completed in accordance with the contractor and subcontractor scopes of works and for ensuring safety and environmental procedures/processes are followed. He/she is also responsible for reporting non-conformances to the Contractor Project Manager. The Contractor Construction Manager also provides support to the Contractor Site Manager and Contractor HSE Manager and for ensuring the Project Manager is informed on all major project developments. The Contractor Construction Manager is accountable to the Contractor Project Manager.

Contractor Site Manager

Contractor The Contractor Site Manager is responsible for ensuring day-to-day works are completed in accordance with the subcontractor scope of works. He/she is also responsible for reporting non-conformances, including safety and environmental issues, to the Contractor Project Manager.

3.4 ACEN's environmental management documentation

ACEN has developed an overarching EMS document which includes a number of plans and strategies that have been put in place to manage environmental impacts that may result from the Blue Springs Road upgrade and for construction of the main site access include biodiversity management plan (BMP), this SWMP and a traffic management plan (TMP).

3.4.1 Prior to commencing construction

In accordance with CoC 5 (Schedule 4), prior to commencing construction, ACEN will submit detailed plans of the final layout of the main site access road development to the Secretary. Plans will be submitted via the Major Projects website, showing comparison to the approved layout.

3.4.2 Compliance with DPE requirements

In accordance with CoC 4 (Schedule 2), ACEN will comply with any requirement/s of the Planning Secretary arising from DPE's assessment of:

- any strategies, plans or correspondence that are submitted in accordance with this consent
- any reports, reviews or audits commissioned by the Department regarding compliance with this consent; and
- the implementation of any actions or measures contained in these documents.

4 Project description

4.1 Blue Springs Road upgrade

As per the Traffic and Transport Assessment (TTA) completed by SCT Consulting (SCT 2020) (EIS Appendix H), Blue Springs Road is a local access road starting from Cope Road in the south and provides sealed access to the project from the east. The unsealed section starts from about 8 km north of the site and extends to the Golden Highway to the north (SCT Consulting 2020).

To use Blue Springs Road effectively for the construction and operation of the Stubbo Solar, the road needs to be upgraded from the intersection of Blue Springs Road and Cope Road to the Site Access Road, a distance approximately 4.66 km, as shown on Figure 4.2. In accordance with commitment T5 of the Amendment Report, ACEN engaged ACOR Consultants (ACOR) to produce a report for the design of the upgrade works required (ACOR 2022a).

The works includes:

- upgrading of road geometry, including improvement of super elevations and pavement widening on curves
- improved formation width, pavement design, delineation, roadside safety treatments and drainage culvert extensions and replacements
- upgrades to the Cope Road Intersection to allow for the heavy vehicles to access the solar farm along with minor upgrades to all other intersections and property access points along the extent of the upgrade works.

Figure 4.1 shows the location of the Blue Springs Road upgrade.

Figure 4.1 Blue Springs Road upgrade area

4.2 Site access construction

Initially, the EIS considered two potential site access roads and these are shown as “Preferred site access” and “Alternative site access” in Appendix 5 of the DC. However, after further consideration including safety, ACEN intends to use the “Alternative option for main site access” road as the main site access.

Access to the Stubbo Solar requires construction of a road suitable to be used by construction and operation vehicles.

The main site access road will be a gravel road and will be an "all weather" road. This is consistent with the Operating Conditions - CoC 10 (Schedule 3).

Figure 4.2 shows the location of the main site access road shown as “Alternative option”. Construction works such as road geometry and pavement construction will be similar to those required to upgrade Blue Springs Road.

In addition to the main site access road, a lay-down area of approximately 7,000 m^2 will be created adjacent to the Blue Springs Road entrance (Figure 4.3) and is proposed as a laydown area for both Blue Springs Road upgrade and the construction of the main site access.

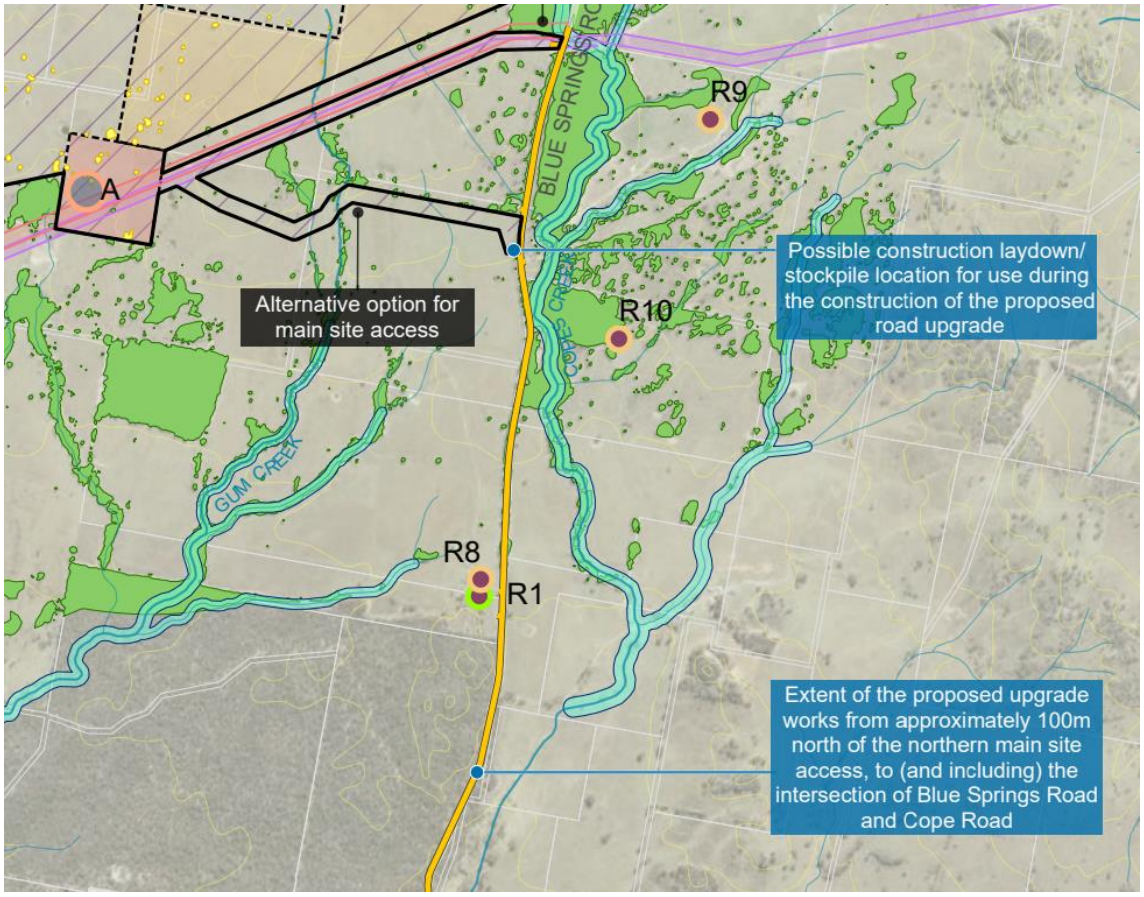


Figure 4.2 Main site access – shown as “alternative option”

Figure 4.3 Main site access showing the lay-down area (from Google Earth)

4.3 Construction schedule

Proposed construction start and finish dates are shown in Table 4.1.

Table 4.1 Construction milestones

Milestone	Date
Blue Springs Road Upgrade	
Construction Start	1 August 2022
Construction Finish	31 December 2022
Site access road (depending on DPE approval)	
Construction Start	1 August 2022 (if concurrent construction with Blue Springs Road Upgrade us permitted)
Construction Finish	31 December 2022 (if concurrent construction with Blue Springs Road Upgrade us permitted)

4.4 Blue Springs Road from Cope Road

In accordance with Condition 8 (Schedule 3), ACEN will upgrade Blue Springs Road from the Cope Road up to a minimum 100 m beyond the selected site access point, as identified in Appendix 5 of the DC.

4.5 Site access

In accordance with Condition 6 (Schedule 3), ACEN is constructing the “alternative site access” point off, as identified in Appendix 5 of the DC.

4.6 Construction stockpile locations

It is expected that up to two construction stockpile locations would be required during construction, one at each end of the proposed upgrade works. It is proposed that one would be within the refined development footprint area for the main site access road. The other would be at the existing north-western corner of the Cope Road / Blue Springs Road intersection, where there is an existing cleared area of suitable size. Consultation with MWRC will be ongoing regarding the use of this area during construction.

4.7 Controls for transport and use of dangerous goods

The controls for transport and use of dangerous goods to the site will comply with:

- *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*
- *Australian Dangerous Goods Code*
- *Australian Standard 4452 Storage and Handling of Toxic Substances*.

It is considered unlikely that materials classified as dangerous goods will be used for the Blue Springs Road upgrade works or for the main site access road construction works. However, if such materials are required, the Contractor will ensure that when they are transported, the controls required to safely transport them are in place.

5 Site characteristics

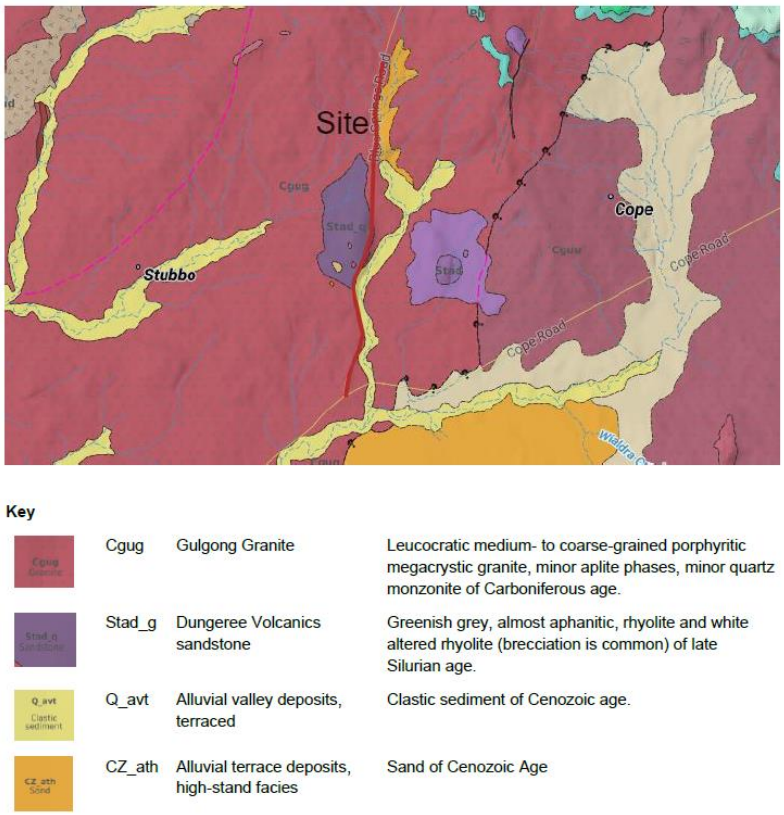
ACOR engaged consultants Kleinfelder to undertake a pavement investigation for the proposed upgrade to Blue Springs Road. This investigation noted physical characteristics that are pertinent to road design and construction, including topography, geology and soils, hydrology and groundwater (Kleinfelder 2021). The investigation included drilling of 20 shallow bores to an approximate maximum depth of 1.5 m below ground level. The details of the investigations are provided below.

5.1 Topography

Investigations noted that Blue Springs Road follows a local north south trending ridgeline with a gentle upward slope northwards from Cope Road in the south. Elevations across the site range from 454 m above the Australian Height Datum AHD) at Cope Road to 518 m AHD at the northern end of the Site.

5.2 Geology and soils

Desktop geological mapping of the site indicates that most of the length of Blue Springs Road upgrade area and its surrounds is Carboniferous-age Gulgong Granite, with a limited outcrop of Silurian-age Dungaree Volcanics. This mapping also shows sedimentary deposits (Cenozoic-age) in some of the gullies. This desktop mapping is shown in Figure 5.1.



Key

Cgug	Cgug	Gulgong Granite	Leucocratic medium- to coarse-grained porphyritic megacrystic granite, minor aplite phases, minor quartz monzonite of Carboniferous age.
Stad_g	Stad_g	Dungeree Volcanics sandstone	Greenish grey, almost aphanitic, rhyolite and white altered rhyolite (brecciation is common) of late Silurian age.
Q_avt	Q_avt	Alluvial valley deposits, terraced	Clastic sediment of Cenozoic age.
CZ_ath	CZ_ath	Alluvial terrace deposits, high-stand facies	Sand of Cenozoic Age

Figure 5.1 Site geology (from Kleinfelder (2021))

Field investigations from drilling the shallow bores noted that the soil profile was generally a sand, silty sand or a silty /clayey gravelly sand, with the exception of two bores where a sandy clay with minor gravel was encountered.

5.3 Hydrology

Investigations noted that the only significant surface water feature present in the vicinity of the site is Copes Creek, a creek that flows approximately parallel to Blue Springs Road, approximately 200 m to 300 m to the east. Copes Creek flows south into Wialdra Creek and ultimately into the Cudgegong River. Overland flow is expected to be away from Blue Springs Road to the east and west.

Figure 5.2 (taken from the EIS) shows the drainage lines in the vicinity of the main site access road. It shows that the main site access road will cross three 1st Order waterways (one being Gum Creek).

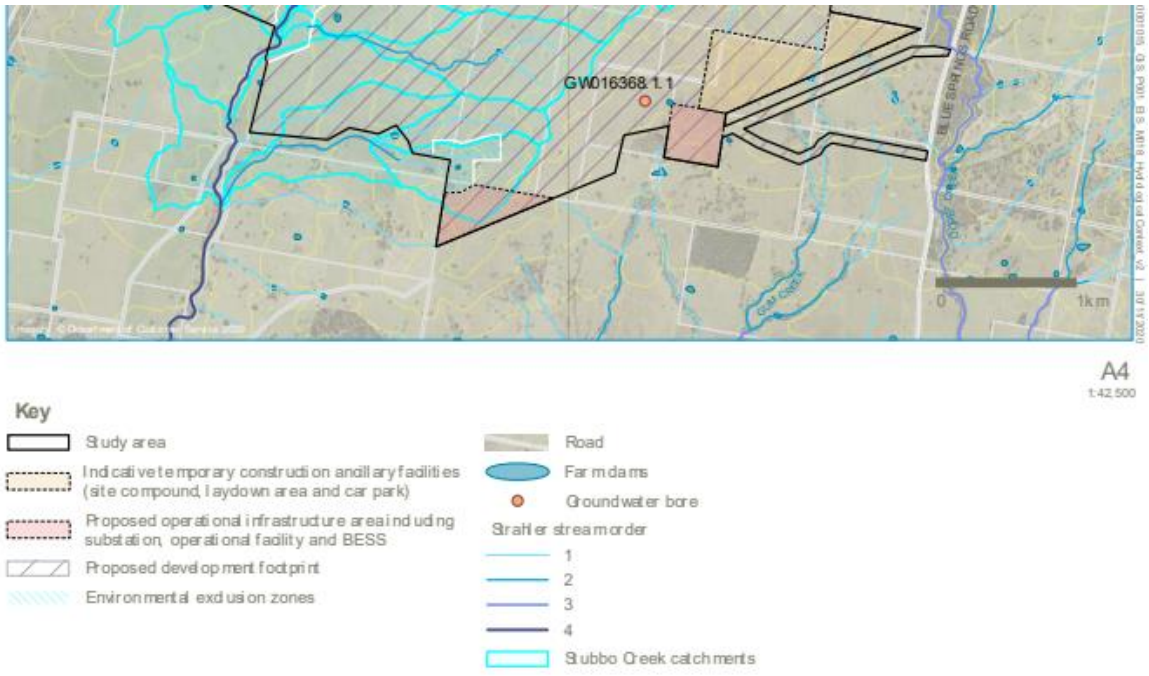


Figure 5.2 Site hydrology site access (from Ramboll (2020))

5.4 Groundwater

Field investigations from drilling the shallow bores noted perched groundwater was encountered in two of the boreholes at approximately 1.5 m below ground level but wasn't encountered in any of the other bores.

6 Control methods

ACEN is committed to implementing an SWMP that follows industry standard management guidelines. This includes general principles, disturbance minimisation principles, site access and construction controls principles and principles for specific site construction works and areas.

The management and mitigation measures described in the following subsections are designed to cover most construction scenarios.

6.1 General principles

Effective erosion and sediment control practices will be adopted based on the following principles (as described by *Blue Book* Landcom (2004) and Catchments and Creeks (2012)):

- integrating erosion and sediment control into site and construction planning
- if working in a watercourse:
  - the natural channel and floodplain form will be maintained (i.e. the dimensions of the watercourse will not be changed)
  - construction activities will be designed to minimise erosion of waterways through the removal of vegetation from the banks, or sediment from bed or banks

  Note: More detail design guidelines for working in a watercourse can be found in Section 5.3.3 (Works in Watercourses) of the Blue Book (Landcom, 2004).
- if installing services:
  - one or more drawings or maps (typically 1:500 to 1:1000 scale) will be prepared showing the layout and details of erosion and sediment control measures, including for:
    - access and haulage tracks
    - stockpile and storage areas
    - temporary work areas
    - materials processing areas
    - crossings (road and creeks)
    - compound areas, such as the contractor's and the principal's facilities
    - any other activities that might affect water quality
  - construction activities will be designed to minimise erosion of waterways by minimising the removal of vegetation from the banks and erosion of sediment from bed or banks
- if constructing and using unsealed roads, ACEN will ensure contractors have:
  - erosion and sediment control checklists
  - work method statements for works in sensitive areas (e.g. in or adjacent to creeks and rivers)
  - an inspection and audit schedule

- ensuring exposed dispersive soils that are susceptible to erosion are covered (e.g. by vegetation establishment, or topsoil) and/or ensuring runoff from these areas is directed to water containment structures that prevent dirty water flowing offsite
- using diversion structures to separate 'clean' water runoff from disturbed area runoff, to minimise volumes of sediment-laden water requiring management
- ensuring sediment-laden runoff is treated via designated sediment control devices (see Section 6.4)
- developing adaptive erosion and sediment controls based on anticipated soil, weather and construction conditions
- minimising the extent and duration of soil disturbance
- maximising sediment retention on site
- maintaining all erosion and sediment control measures in proper working order
- rehabilitating disturbed areas within two weeks after works have been completed
- monitoring the site and adjusting erosion and sediment control practices as required to maintain adherence to the above principles.

In addition to NSW guidelines, the Civil Contractors Federation of Victoria (CCF) has published information for use by the Victorian civil construction industry, and this document provides valuable examples (including diagrams) of sediment and erosion controls (CCF 2010). The sections of the CCF guidelines relating to sediment and erosion controls are attached as Appendix B.

6.2 Disturbance minimisation principles

Land disturbance will be minimised by clearing only the working areas of land ahead of works and rehabilitating the working area as soon as possible after works have been completed. All clearing works will be undertaken using the following controls:

- confirming and delineating (using fencing or bunting) areas required to be disturbed (e.g. areas of road construction or widening, access tracks, stockpiles, lay-down area) prior to commencement of work and ensuring that disturbance is limited to those areas
- confirming and delineating (using fencing or bunting) any no-go zones requiring protection (such as habitat trees or high value vegetation)
- leaving native root-balls in the ground, where practicable, to facilitate regeneration after works are complete.

6.3 Site access construction and control principles

When site access tracks are being constructed, the following measures will be followed:

- restrict access to excessively wet or boggy areas by limiting or diverting vehicle movements around such areas

- confine plant movement to access points using barrier tape or similar to delineate no-go areas
- use a catch drain / roll-over at the base of the access track to divert and manage any sediment-laden (see Section 6.5.5)
- where a ramp has to be excavated as part of the site access track, use clean compacted natural aggregate that will not cause environmental harm. Shape the surface to shed water to surrounding vegetated areas
- use rubber tyred/tracked vehicles where available
- ensure tracks are free draining
- include cross fall and outfall drainage, where required, to prevent the concentration of run-off.

Illustrated examples of drain types and their construction are provided in Appendix B.

6.4 Working near waterways (including waterway crossings)

When working near waterways, ACEN will ensure works are undertaken in accordance with the following documents:

- *Controlled Activities on Waterfront Land - Guidelines for watercourse crossings on waterfront land*. (Office of Water NSW 2012a), or its latest version
- *Controlled Activities on Waterfront Land - Guidelines for instream works on waterfront land*. (Office of Water NSW 2012b), or its latest version
- *Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors. (Natural Resources Access Regulator (NRAR) 2018)*, or its latest version
- *Working on Waterfront Land Fact Sheet (NRAR 2020)*, and
- *Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013)*, or its latest version.

The main site access road proposes to cross three 1st Order waterways – see Section 5.3 above. 1st Order streams require a 10 m riparian corridor to be maintained on each side of the watercourse and, if works are proposed within that corridor, that is considered a Controlled Activity and would generally require a Controlled Activity Approval (CAA). However, no CAA is required as the exemption provided in Clause 4.41(g) of Section 91 of the Water Management Act 2000 applies to the development.

6.5 Site-specific construction management and control measures

6.5.1 General site layout

Prior to commencement of construction, ACEN will develop maps (or drawings) at a scale of 1:500 or 1:1000 scale that show the layout and details of erosion and sediment control measures, including the main access and haulage routes.

ACEN engaged ACOR to produce detailed design drawings of the upgrade works required for Blue Springs Road (ACOR 2022b), which show the proposed locations of sediment and erosion control measures along the construction site. These design drawings are provided in Appendix C ACOR (2022). When preparing any maps showing the layout and details of erosion and sediment control measures, ACEN will reference the ACOR drawings.

6.5.2 Road construction

Soil and water management controls adopted during site access/road construction will be in accordance with the *Blue Book* (Landcom 2004).

Access roads and the entrance will be designed with adequate run-off controls to prevent erosion from concentrated flows.

6.5.3 Soil exposure

Exposure of soil will be minimised and, where practicable, covered with mulched native vegetation re-used from clearing of the development site. This will assist with stabilising bare ground.

High erosion areas including batters will be stabilised by mulching and seeding within seven days of completing works.

Grass is to be seeded and maintained as soon as possible after construction, with grass species selected in accordance with Council requirements. Grassing of table drains and swales and seed all other disturbed areas including trenches which have not been grassed. On completion of works provide strip grassing.

6.5.4 Topsoil stockpiling

Any topsoil that is removed during construction works will be stockpiled for later rehabilitation. Topsoil stockpiles will be located away from stormwater flows, and ephemeral or permanent waterways, in areas where flood risk is low. Topsoils will also be placed in areas where access will not cause vegetation damage.

Before spreading topsoil, the ground will be scarified along-contour to break any compacted and/or smooth areas and enable the topsoil to key into the substrate. Topsoil will not be applied to batters where keying is not possible:

Topsoil will be applied to a depth of:

- approximately 40 mm to 60 mm on lands where the slope exceeds a horizontal to vertical ratio of 4(H):1(V)
- at least 75 mm on sites where the slope is less than 4(H):1(V).

When the respreading process is completed, disturbed lands will be left with a scarified surface to inhibit soil erosion, to encourage water infiltration and to assist with keying topsoil.

6.5.5 Catch drains/cut-off drains/roll-overs

Catch drains / cut-off drains / roll overs may be established to convey run-off from disturbed areas to sediment ponds or dams.

A catch drain / cut-off drain / roll-over will be located alongside the Site Access Road to divert any sediment-laden water into a small, excavated sediment trap or U-shaped sediment trap formed with a sediment fence. Built up sediment will be regularly removed from the trap as necessary and disposed to an appropriate location (see Appendix B).

Where required, drains will be line with geotextile or plastic, to reduce erosion.

Catch drains / roll overs will also be used downstream of working areas.

6.5.6 Sediment control devices

SEDIMENT FENCES

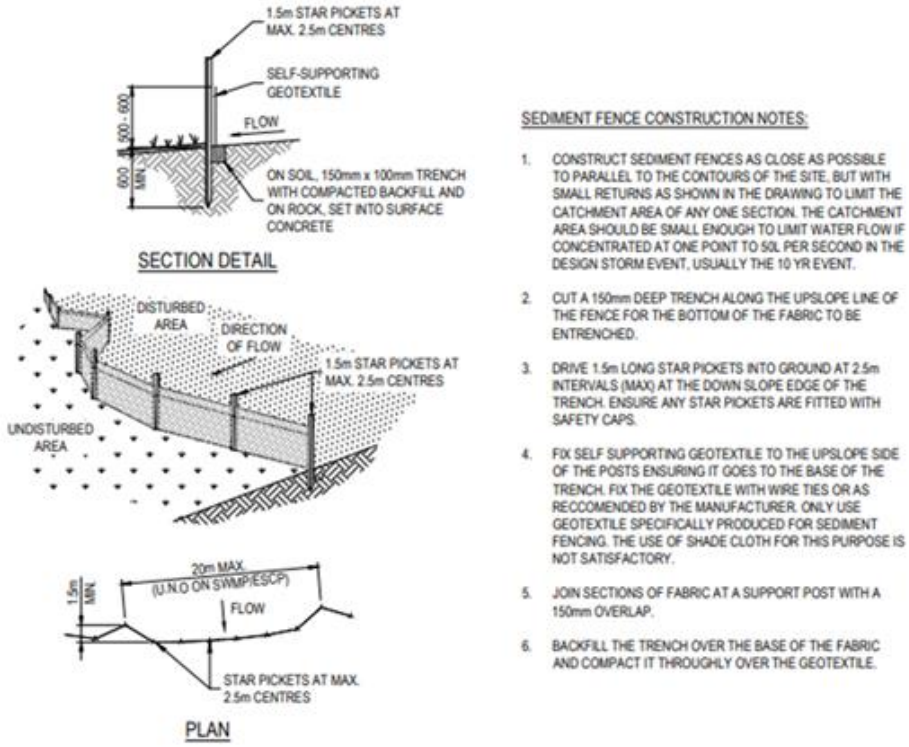
Sediment fences will be installed along contours in accordance with the plans listed in Section 6.4.1. See excerpt below (Figure 6.1) from Drawing C103-101 (ACOR 2022b). Sediment fences are to be constructed using geotextile filter fabric with structural posts to be spaced no more than 2.5 m apart.

STRAW BALE FILTERS

Straw bale filters will be installed parallel to the contour of the site in accordance with the plans listed in Section 6.4.1. See excerpt below (Figure 6.2) from Drawing C103-101 (ACOR 2022b). Bales will be tightly abutting with a maximum height of one bale.

STABILISED SITE ACCESS

Stabilised site access works to retain sediment will be installed in accordance with the plans listed in Section 6.4.1. See excerpt below (Figure 6.3) from Drawing C103-101 (ACOR 2022b).



SEDIMENT CONTROL FENCE DETAIL (TO SD6-8)
NOT TO SCALE

Figure 6.1 Sediment Control Fence Detail

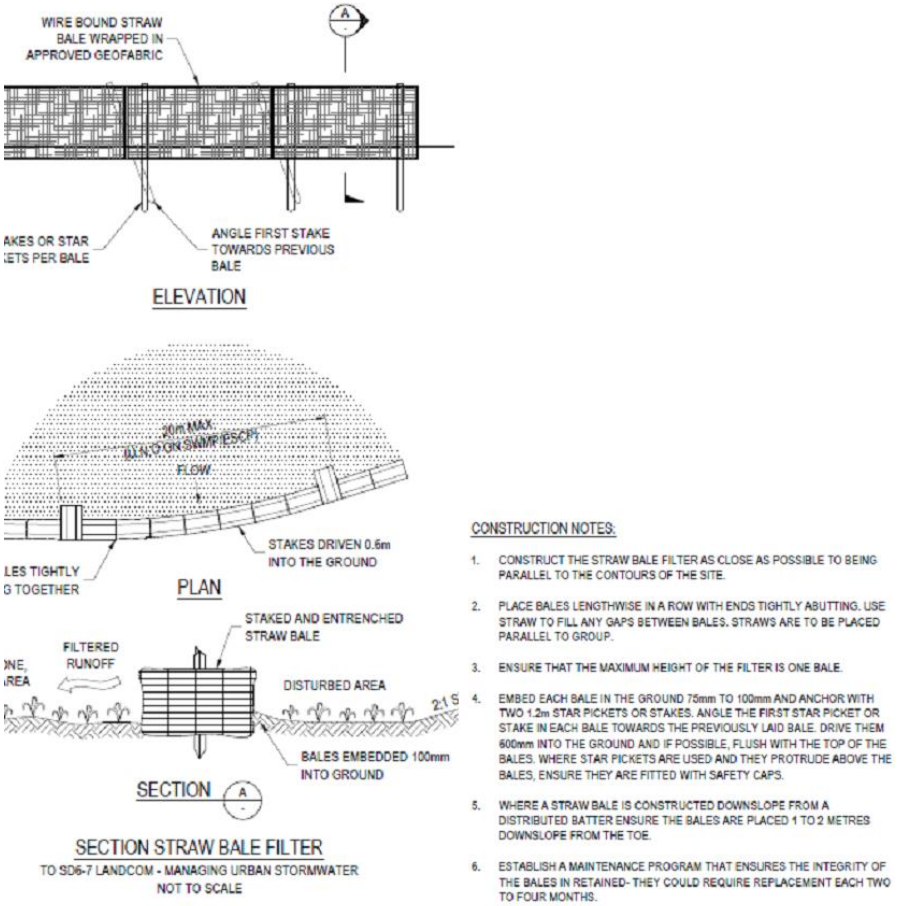


Figure 6.2 Straw Bale Filter Detail

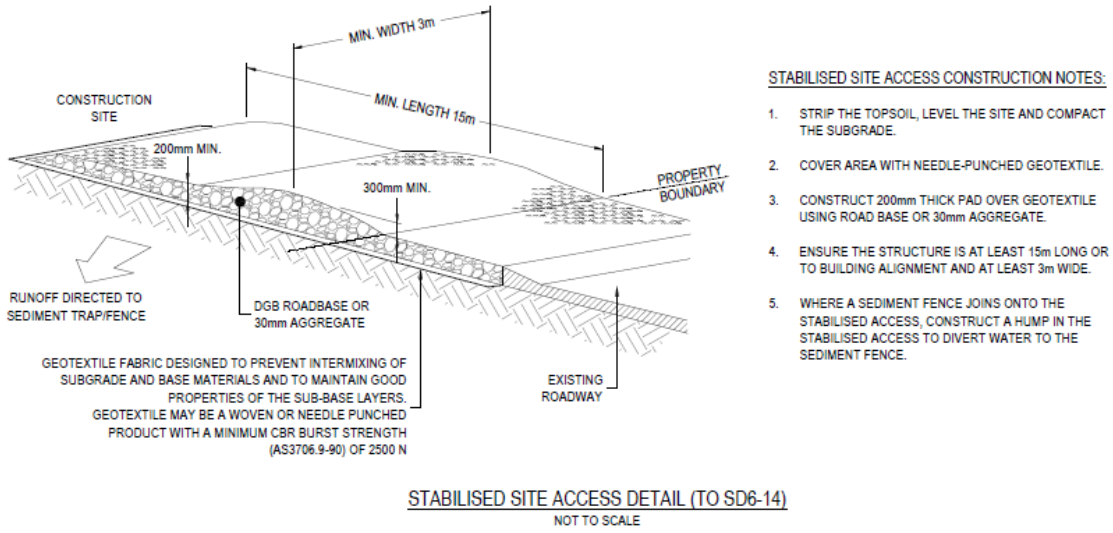


Figure 6.3 Stabilised Site Access detail

6.5.7 Dust

The following measures will be undertaken to mitigate the generation of dust and associated dust erosion:

- Water trucks will be used for dust suppression as required along internal, unsealed access roads and disturbed areas (i.e. if dust emissions are observed).
- The traffic management plan will include optimisation and minimisation of vehicle movements onsite reducing wheel generated dust.
- Dust suppression measures will take into consideration weather conditions (including wind strength and direction), extended dry periods and MWRC water restriction levels.

6.5.8 Contaminated water disposal

Contaminated water trapped anywhere on site must be removed. If the water is contaminated with chemicals, it must be pumped into a container and removed off-site to be disposed of at an appropriate facility. If trapped water is contaminated only with sediment, it should be managed by pumping and disposal by spreading it onto well-vegetated lands at least 40 m from ephemeral or permanent waterways. The water is to be spread evenly so it infiltrates and does not scour. If it is not possible to spread the water 40 m from the waterways, it must be removed off-site.

6.5.9 Site Rehabilitation

Progressive rehabilitation by stabilisation and revegetation is to be conducted as soon as areas are no longer required to be used.

Topsoil removed during construction phases will be stored and reused during rehabilitation. Soil stabilisation controls such as topsoil re-establishment, stabilisation matting, rock armouring, seedbed establishment, and tube stock planting will be considered (see Appendix B).

7 Monitoring, inspections and response

Inspections and monitoring are an important part of erosion and sediment control and are outlined below, along with the means of recording of these activities. Specific monitoring is provided in the monitoring table (attached as Appendix D).

7.1 Weather monitoring

Weather monitoring is an important aspect of construction planning as severe weather conditions can disrupt site activities. Weather will be monitored on a weekly basis, or more frequently during periods of unstable weather patterns.

Forecasts of rainfall of 10 mm (or more) over a 24-hour period will necessitate erosion and sediment control structure inspections. If substantial wet weather is forecast (i.e. a large weather system in which substantial rainfalls are predicted), works will be suspended, or strategies put in place in order to remove equipment from the ephemeral waterways.

7.2 Inspections

If there is a greater than a 50% chance of more than 10 mm rainfall occurring over a 24-hour period within the forecast period, the Contractor HSE Manager (or delegate) will inspect the condition of all erosion and sediment controls. Repair and maintenance works will be actioned and, where practicable, completed before the onset of rain.

Weekly inspections of all erosion and sediment controls will be conducted by the Contractor HSE Manager (or delegate).

The following indicators will be used to identify if the objectives of this plan are being met:

- visible evidence of deterioration of water quality (e.g. high turbidity) in downstream watercourses that is directly attributable to the site
- visible significant erosion
- failure of control measures.

If the above indicators are observed, investigation and maintenance will be triggered (see below).

7.3 Investigation and maintenance

If investigation and maintenance is triggered, the following remedial actions will be implemented:

- locating the source of water quality deterioration, the cause of erosion or the reason for the failure of a control measure
- limiting the continuing deterioration of water quality or the progression of erosion by implementing temporary controls

- repairing existing controls, implementing additional permanent controls and/or modifying procedures to prevent future deterioration in water quality or occurrence of erosion.

The investigation will occur as soon as an issue has been identified and maintenance works will be conducted as soon as practicable during and after the investigation.

7.4 Register of activities

The Contractor will maintain a register of erosion and sediment control activities, including records of inspection and maintenance.

8 Community and stakeholder engagement

8.1 Consultation during project planning

Community and stakeholder consultation was undertaken during the preparation of the EIS for the Project and responses were taken into consideration in the design of both the Project and the environmental impact mitigation measures.

Details of the consultation undertaken during the EIS stage are provided in Chapter 5 of the EIS.

8.2 Engagement with Regulators

8.2.1 Notifications to DPE prior to key project stages

In accordance with CoC 4 (Schedule 4), prior to commencing construction, operations, upgrading or decommissioning of the development or the cessation of operations, the Applicant (ACEN) will notify DPE in writing via the Major Projects website portal of the date of commencement, or cessation, of the relevant phase.

If any of these phases of the development are to be staged (as is proposed with the current construction works), then the Applicant (ACEN) will notify DPE in writing prior to the commencement of the relevant stage, and clearly identify the development that would be carried out during the relevant stage.

8.2.2 Consultation with Council

In accordance with CoC 27 (Schedule 4) prior to commencing construction the Applicant (ACEN) must prepare a SWMP for the development in consultation with Department of Planning, Industry and Environment (DPIE) Water. Appendix E lists the consultation undertaken to date.

In accordance with commitment T11 of the Amendment Report, ACEN will continue consultation with MWRC regarding the use of the existing cleared area located at the north-western corner of the Cope Road and Blue Springs Road intersection as a potential laydown area/stockpile location during construction of the Blue Springs Road upgrade.

8.2.3 DPE review of SWMP

ACEN provided DPE – Water with the draft of the SWMP for comment (as noted in Appendix E). DPE – Water had two comments:

- recommending Guidelines for Controlled Activities – Watercourse Crossings be considered when activities are proposed near waterways to be undertaken when constructing the main site access road
- reference be made to drawings prepared by ACOR in 2022, which should show the location of sediment and erosion control measures along the construction site.

These recommendations have been incorporated into this revised SWMP.

8.3 Consultation during construction

To ensure the community is kept informed of works at the site, ACEN will:

- make information available on the Stubbo Solar Facebook page (https://www.facebook.com/StubboSolarFarm)
- make information available at the ACEN Gulgong office
- Inform residents along Blue Springs Road by mail and provide them with information such as timeframes, contact numbers, etc.

ACEN will keep a record of engagement activities, an example of which is provided in Appendix E.

8.4 Website

A website has been established for the Project https://stubbosolarfarm.com.au/

This website will be maintained and kept up-to-date by the Applicant (ACEN). In accordance with CoC 17 (Schedule 4) the website will make the following information publicly available at minimum, as relevant to the stage of the development:

- EIS and response to submissions
- the final layout plans for the development
- current statutory approvals for the development
- approved strategies, plans or programs required under the conditions of this consent
- the proposed staging plans for the development if the construction, operations or decommissioning if the development is to be staged
- how complaints about the development can be made
- a complaints register (see Section 9 of EMS)
- compliance reports
- any independent environmental audit, and the Applicant's response to the recommendations in any audit (see Section 7.5 of EMS)
- any other matter required by the Secretary.

8.5 Dissemination of environmental information

ACEN commits to ensuring stakeholders are kept informed about the environmental performance of the development. This will be achieved by:

- ensuring the website is updated with environmental performance data
- making information available at the ACEN Gulgong office

- informing residents along Blue Springs Road by mail and providing them with information such as timeframes, contact numbers, etc.

9 References

ACOR (2022a). Stubbo Solar Farm: Design Report – Blue Springs Road, prepared for UPC\AC Renewables Australia Pty Ltd by ACOR Consultants. 22 April 2022.

ACOR (2022b). Mid-Western Regional Council Stubbo Solar Farm: Detailed Design – Blue Springs Road (NSW212453-DD-REVA), prepared for UPC\AC Renewables Australia Pty Ltd by ACOR Consultants. 22 April 2022.

Catchments and Creeks (2012). Principles of Construction Site Erosion and Sediment Control – A Training Tool for the Construction Industry, V1. Catchments and Creeks, December 2012.

CCF Victoria (2010). Environmental Guidelines for Civil Construction. Civil Contractors Federation of Victoria, May 2010.

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DECC (2009). Interim Construction Noise Guideline. Department of Environment and Climate Change NSW. July 2009.

DPI (2013). Policy and Guidelines for Fish Habitat Conservation and Management. Department of Primary Industries (2013).

Kleinfelder (2021). Pavement Investigation – Stubbo Solar Farm Blue Springs Road Widening, prepared for ACOR Consultants Pty Ltd by Kleinfelder Australia Pty Ltd. May 2021.

Landcom (2004). Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, Office of Environment, New South Wales NSW EPA (2017). NSW Noise Policy for Industry.

NRAR (2018). Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors. NSW Department of Industry May 2018.

Office of Water NSW (2012a). Controlled Activities on Waterfront Land - Guidelines for watercourse crossings on waterfront land. NSW Department of Primary Industries July 2012.

Office of Water NSW (2012b). Controlled Activities on Waterfront Land - Guidelines for instream works on waterfront land. NSW Department of Primary Industries July 2012.

Ramboll (2020). Stubbo Solar Farm: Environmental Impact Statement, prepared for UPC\AC Renewables Australia Pty Ltd by Ramboll Australia Pty Ltd. December 2020.

Ramboll (2021). Stubbo Solar Farm: Amendment Report, prepared for UPC\AC Renewables Australia Pty Ltd by Ramboll Australia Pty Ltd. June 2021.

SCT Consulting (2020). Traffic and Transport Assessment, Stubbo Solar Farm: EIS, prepared for UPC\AC Renewables Australia Pty Ltd by Ramboll Australia Pty Ltd. 9 December 2020.

Appendix A
Conditions of Consent reference table

Table A1 Conditions of Consent reference table

No	Condition	Reference
25	The Applicant must ensure that the development does not cause any water pollution, as defined under Section 120 of the *Protection of the Environment Operations Act (1997)* - the POEO Act	See Section 6
	Operating Conditions	
26	The Applicant must:	
26a	minimise erosion and control sediment generation	See Section 6
26b	ensure any solar panels and ancillary infrastructure and any other land disturbance associated with the construction, upgrading or decommissioning of the development have appropriate drainage and erosion and sediment controls designed, installed and maintained in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) manual, or its latest version	See Section 6
26c	ensure the solar panels and ancillary infrastructure (including security fencing) are designed, constructed and maintained to reduce impacts on surface water, localised flooding and groundwater at the site	See Section 6
26d	ensure all works are undertaken in accordance with the following, unless DPIE Water agrees otherwise: • Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018), or its latest version; and • Policy and Guidelines for Fish Habitat Conservation and Management (2013), or its latest version	See Section 6
	Soil and Water Management Plan	
27	Prior to commencing construction, the Applicant must prepare a Soil and Water Management Plan for the development in consultation with DPIE Water. This plan must:	See Section 8.2
27a	demonstrate how the project will meet conditions 25 and 26(a) to (d); and	See Section 6
27b	include details of the soil erosion control measures including sediment basins	See Section 6

Table A2 Construction-phase commitments reference table

No.	Commitment Description	Reference
	Biodiversity	
B5	Appropriate controls will be implemented to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways. All works within proximity to the drainage lines will have adequate sediment and erosion controls (e.g. sediment barriers, sedimentation ponds). Revegetation will also commence as soon as is practicable to minimise risks of erosion.	See Section 6.0
	Soils	
S1	Disturbed areas will be progressively stabilised and rehabilitated as construction is completed to minimise the extent of bare soil.	See Section 6.4.3 and 6.4.9
	Water	
W6	Further flood investigations and hydrological and hydraulic modelling will be carried out where required during detailed design to ensure the flood immunity objectives and design criteria for the project are met. The modelling will be used to define the nature of both main stream flooding and major overland flow across the development footprint under pre-and post-project conditions and to define the full extent of any impact that the project will have on patterns of both main stream flooding and major overland flow.	Detailed design
W7	A construction soil and water management plan (CSWMP) will be prepared to outline measures to manage soil and water impacts associated with the construction works, including contaminated land. The CSWMP will provide: • measures to minimise/manage erosion and sediment transport both within the construction footprint and offsite including requirements for the preparation of erosion and sediment control plans (ESCP) for all progressive stages of construction Measures to manage waste including the classification and handling of spoil • procedures to manage unexpected contaminated finds • measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation • measures to manage accidental spills including the requirement to maintain materials such as spill kits • controls for receiving waterways which may include: – Designation of 'no go' zones for construction plant and equipment – Creation of catch/diversion drains and sediment fences at the downstream boundary of construction activities where practicable to ensure containment of sediment-laden runoff	This report See Section 6.0

No.	Commitment Description	Reference
	• erosion and sediment control measures will be implemented and maintained at all work sites in accordance with the principles and requirements in Managing Urban Stormwater –Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008b), commonly referred to as the "Blue Book".	

ACCENT ENVIRONMENTAL

Appendix B
Sediment and erosion control examples

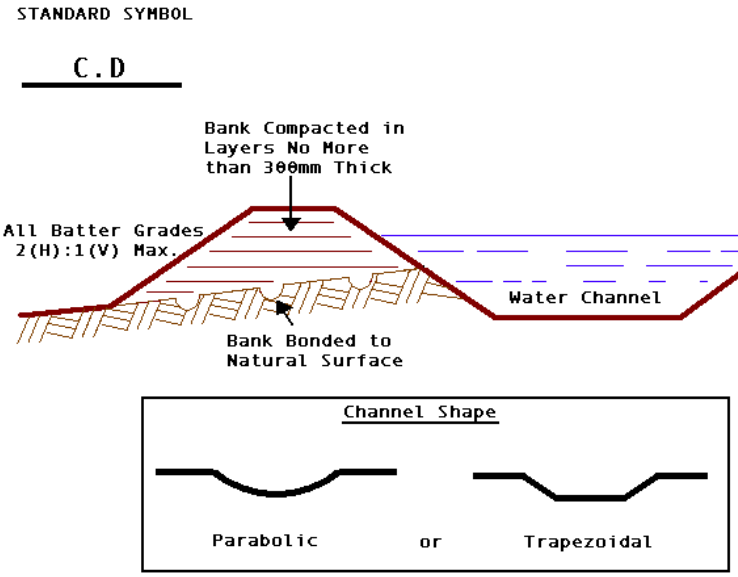
2.2 Drainage construction examples

There are a large number of control devices that will suit most circumstances. Most erosion damage occurs in the initial part of a storm, between 30 minutes and two hours into a storm, and during prolonged storms.
Designs of control structures, therefore, need to account for peak run-off flows. Where it is not possible to schedule works to avoid times of the year when high rainfall is expected, then additional controls may be required, such as installing extra sediment traps or enhancing the capacity of existing controls.

The following diagrams and photographs depict construction examples for drainage control for;

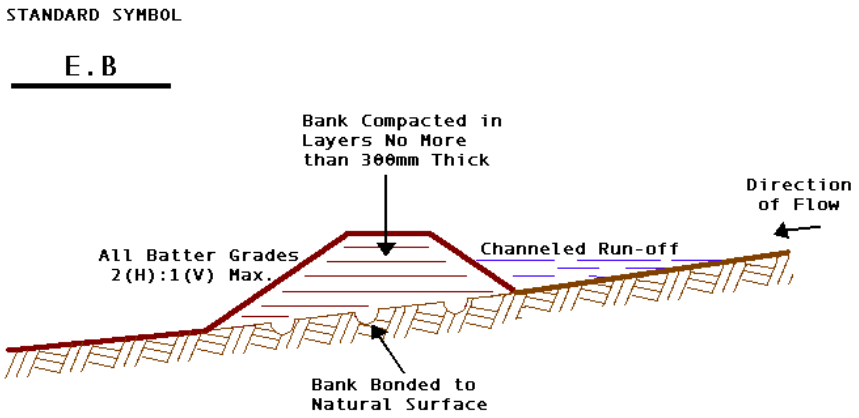
- Catch drains 2.2.1 below.
- Cut-off drains are temporary applications of catch drains and are usually constructed with a grader. These are particularly useful for capturing and channeling sheet flow from exposed areas. They reduce the length of the run-off flow path, thereby reducing the velocity and associated erosive flow.
- Cut-off drains should be constructed along the contour.
- Earth Banks 2.2.2 below.
- Level Spreaders at discharge points help to stop erosion at discharge points 2.2.3 below.
- Down drains 2.2.4 below.
- Lined Channels 2.2.5 below.
- Energy dissipaters at discharge points 2.2.7 belowStabilisation matting 3.1.1 below.
- Rock armouring / beaching 3.1.2 below.

2.2.1 Catch drains



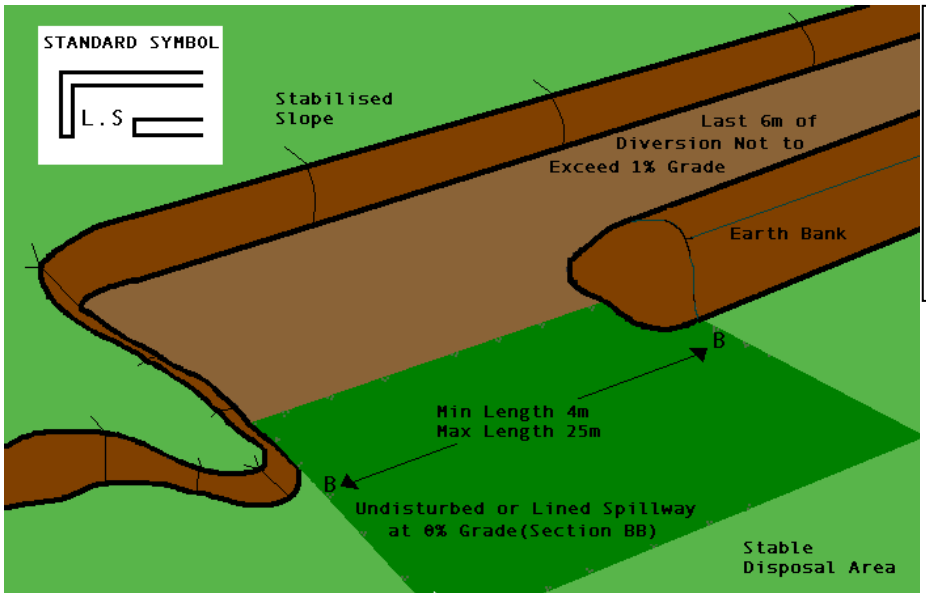
Catch Drain construction, Illustration reproduced courtesy of the ACT Environment Protection Authority (ACT, 1998.) Catch drains, also known as cut and fill diversion channels, are excavated drainage paths. Catch drains should be stabilised within 14 days of installation through the use of grassing, stabilisation matting or rock armouring.

2.2.2 Earth banks (or Cut off Drains)



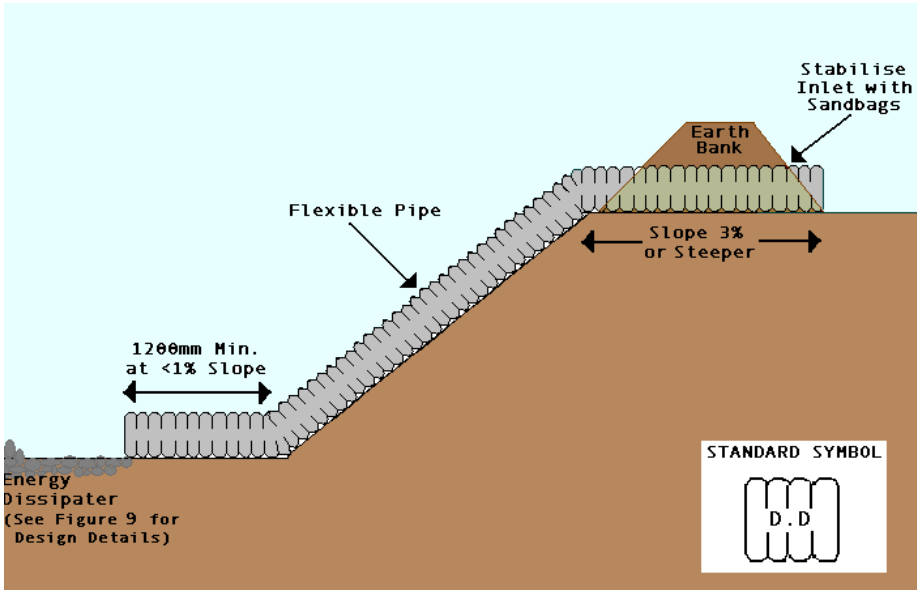
Earth Bank (or Cut off Drains) construction, from (ACT, 1998.)
Earth Banks are used for channeling water to a desired location. Earth banks should be stabilised within 14 days of installation through the use of grassing, stabilisation matting or rock armouring.

2.2.3 Level spreaders at discharge points



Level spreader, from (ACT, 1998.)
A level spreader should be used at the outlet of a catch drain or earth bank to convert the concentrated flow to sheet flow.

2.2.4 Down drains

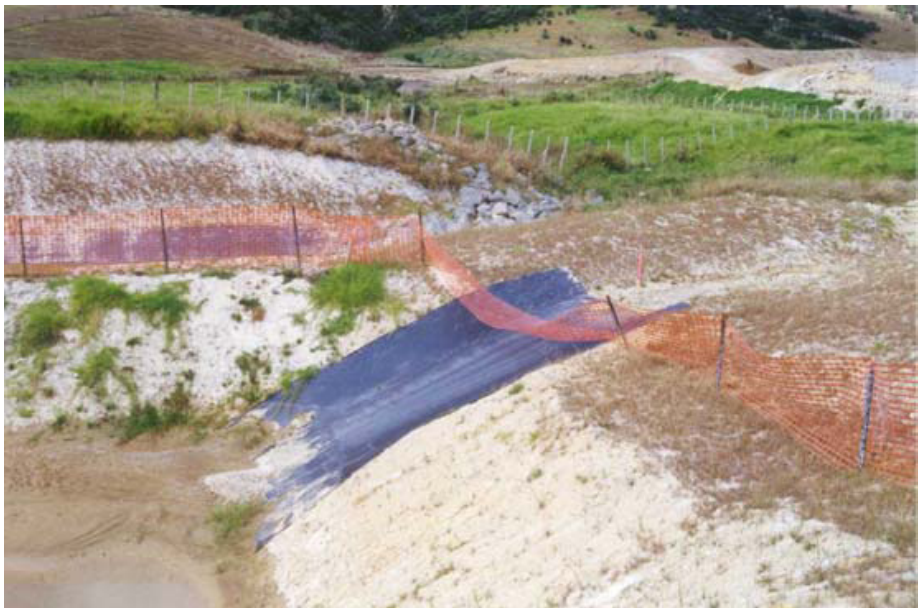


Down Drain, (NSW Dept. of Housing, 1998 and ACT, 1998.)

Down drains or lined channels may be used to transport water down slopes and batters without eroding them.

A catch drain or earth bank is constructed along the top of the batter to prevent uncontrolled flow down the batter and to direct run-off to the down drain or lined channel.

2.2.5 Lined channels



Lined Channels (courtesy of Tony King, CPESC), EPA, 2004

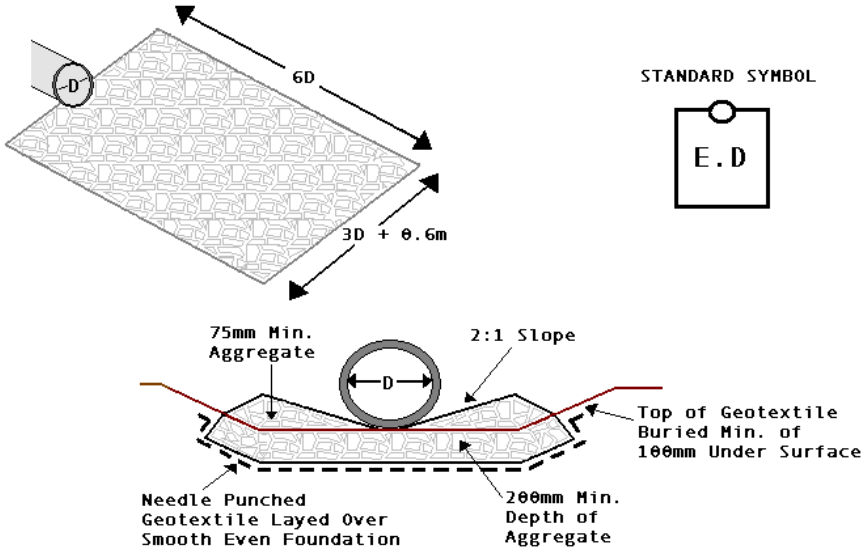
A lined channel should be constructed similarly to a down drain, excepting a channel is cut down the batter in place of a pipe and the channel is lined with stabilisation matting or geotextile.

Rock lining should be considered for more permanent structures

2.2.6 Lined channels

Lined Channels (courtesy of Tony King, CPESC), EPA, 2004

2.2.7 Energy dissipaters at discharge points



Energy Dissipater (Figures from NSW Dept. Housing, 1998 and ACT, 1998)

An energy dissipater should be used at the outlet of a down pipe or lined drain to slow velocity and associated erosive flow.

3 Drainage stabilisation - matting

Stabilisation Matting Used to Stabilise Drainage Channel (Photo courtesy of O_2 Environmental)

Stabilisation methods include:

- Stabilisation matting is particularly useful in areas where concentrated flows of run-off occur (eg within catch drains, drainage channels, outfall drains). Use the largest weave practical to aid natural re-vegetation.
- Rock Beaching (Below)
- Grassing- slows down water run-off, increases infiltration and acts as a filter to trap soil particles.
- Mulch- slows down water run-off.
- Revegetation.

3.1.1 Rock armouring / beaching – stabilise drainage

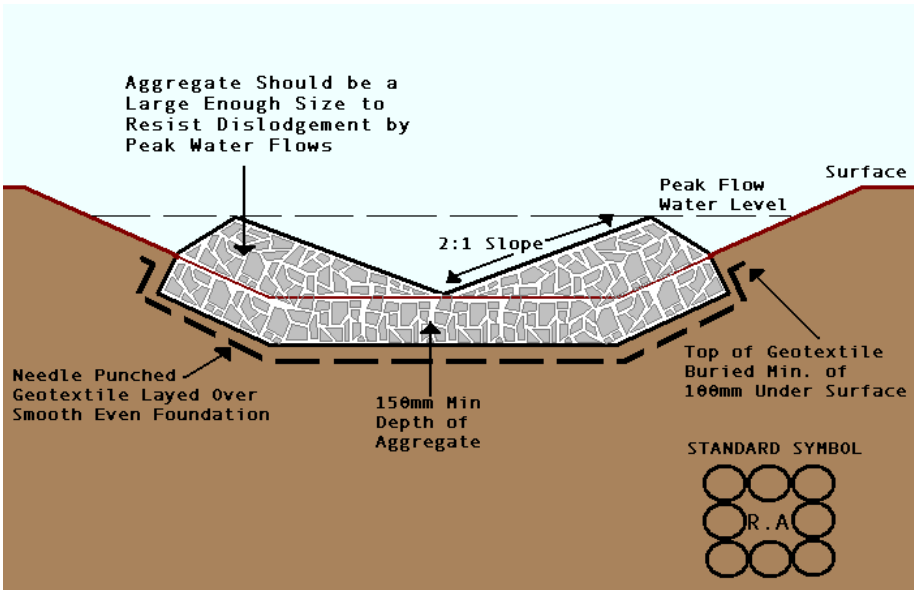
Rock Armouring, (EPA, 2004)

Rock armour slows water flow and is used in areas such as drainage channels, catch drains, outfall drains, outlets/ inlets to sediment basins, and bends of waterways.

Use of a liner under the rock will reduce undermining and can reduce the thickness of rock to be placed.

Ensure that the rocks are large enough to resist dislodgment by peak water flows. It is recommended that an assortment of rock sizes are used, instead of one uniform size (US EPA, 2003).

3.1.2 Rock armouring / beaching – stabilise drainage



Rock Armouring-Cross Section (from EPA Victoria Publication 275 and NSW Dept. of Housing, 1998)

4 Sediment Control

Soil eroded during land disturbance can wash away and contaminate stormwater and adjacent waterways.

The type of sediment controls suitable for any site will depend on the rainfall patterns, soil type and topography. These factors need to be taken into account when selecting appropriate controls and ensuring that designs are adequate on all drainage lines.

Silt loads should be treated as close to their source as possible using effective sediment traps such as geotextile fences and straw bales.

Important installation tip for sediment controls in channels

When installing sediment retention structures in channels ensure that the bottoms of the outer edges of the structure are higher than the top of the centre of the structure. This allows run-off to overtop the control in high flow events, rather than pass around it. The use of a string line is a good way to ensure that the levels are correct. This is shown in several of the following sediment control diagrams, for example see 4.1.7.

Inspection, maintenance and cleaning

The effectiveness of sediment control devices depends on an adequate inspection, maintenance and cleaning program. Inspections, particularly during storms, will show whether devices are operating effectively (see section 9.1). Where a device proves inadequate, it should be quickly redesigned to make it effective. Wind events and accessibility of the area to the public should be factored into any inspection protocols.

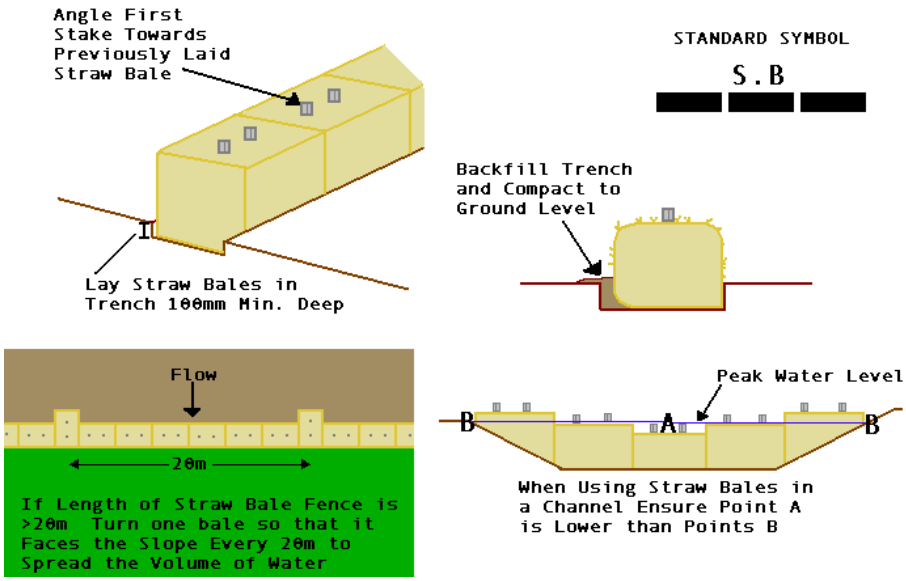
4.1 Sediment control examples

There are a large number of control methods and devices that will suit most circumstances. Most erosion damage occurs in the initial part of a storm, between 30 minutes and two hours into a storm, and during prolonged storms. Designs of control structures, therefore, need to account for peak run-off flows.

The following diagrams and photographs depict construction examples for sediment control for;

- Straw bales 4.1.1 below.
- Silt fences including geotextiles 4.1.3 below.
- Straw bale silt fence 4.1.5 below.
- Synthetic filters (e.g. dacron) 4.1.6 below.
- Biodegradable logs (Coir) 4.1.9 below.
- Rock bund 4.1.9 below.
- Stone and straw bale sediment trap 4.1.11 below.
- Check Dams 4.1.12 below.
- Silt fence sediment trap 4.1.13 below.

4.1.1 Straw bales



Straw Bales (VSAP Building Construction Sites Project Group, 2003 and LGPro, 2002) For effective treatment utilising straw bales:

- Ensure that straw bales and not hay bales are selected. Hay bales should not be used due to their seed content.
- Rock Bund or Synthetic bales are superior alternatives to straw bales
- A line of straw bales should service a catchment no greater than 0.5 Ha (ACT, 1998).
- Replace bales approximately every three months ensuring minimal disturbance.

4.1.2 Straw bales

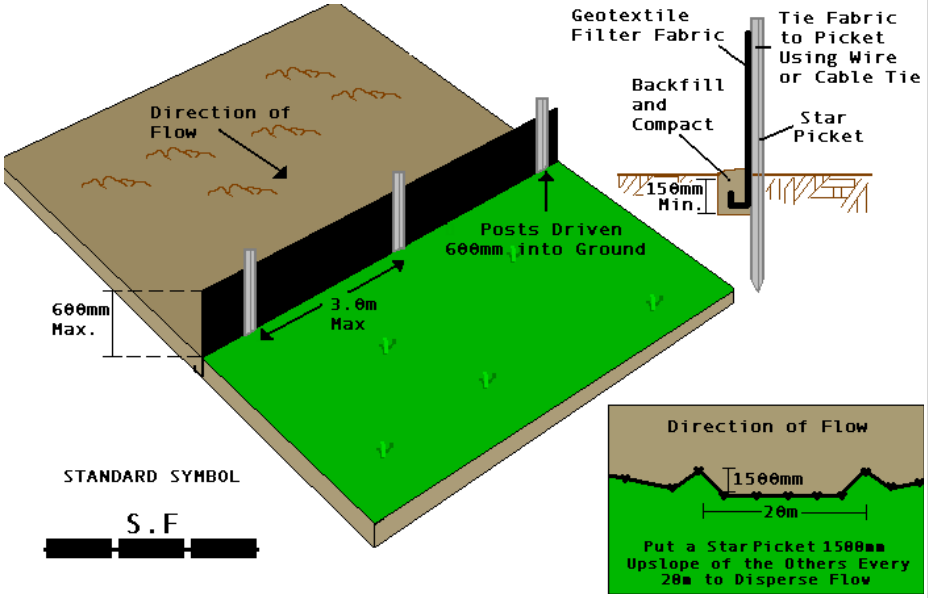
Gap Between Straw Bales make this control ineffective, (EPA, 2004,)

When installing straw bales ensure that no gaps are left between the bales. Run-off flowing through a gap concentrates flow, which can worsen erosion.

Prevent gaps between bales by angling the first stake in each bale toward the previously installed bale to push them together. Any loose straw should be placed up-slope of the straw bales, as it will fill any smaller gaps during run-off flows.

It is advisable that a silt fence is installed in conjunction with straw bales to minimise gaps.

4.1.3 Silt fences including geotextiles

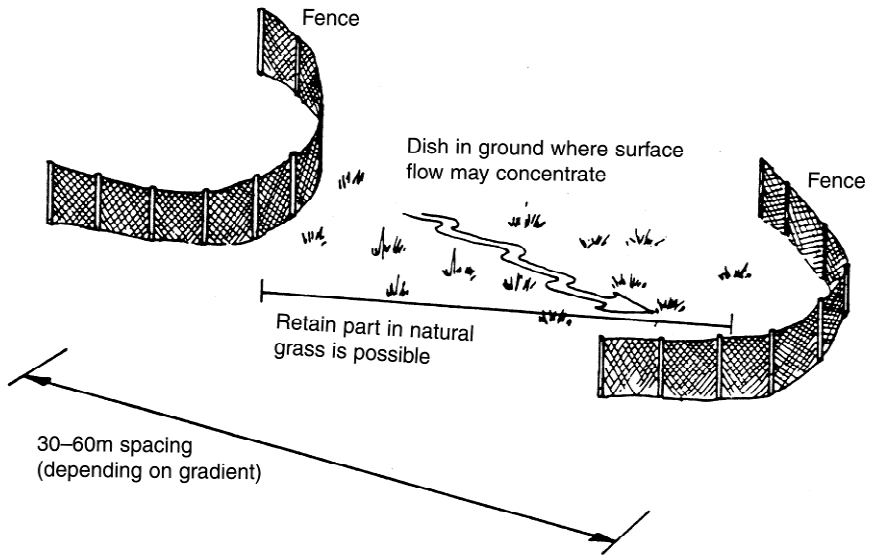


Silt Fence (VSAP Building Construction Sites Project Group, 2003)
Silt fences should not service a catchment area **greater than 0.6 Ha** per line of fence and are not appropriate for areas of high flow (ACT, 1998).

Silt fences may be reinforced with wire mesh or by placing star pickets every metre where there is a risk of them being knocked over by run-off, work activities or wind.

Silt fences are effective for removal of coarse sediment however have limited to no filtering capacity for fine clays.

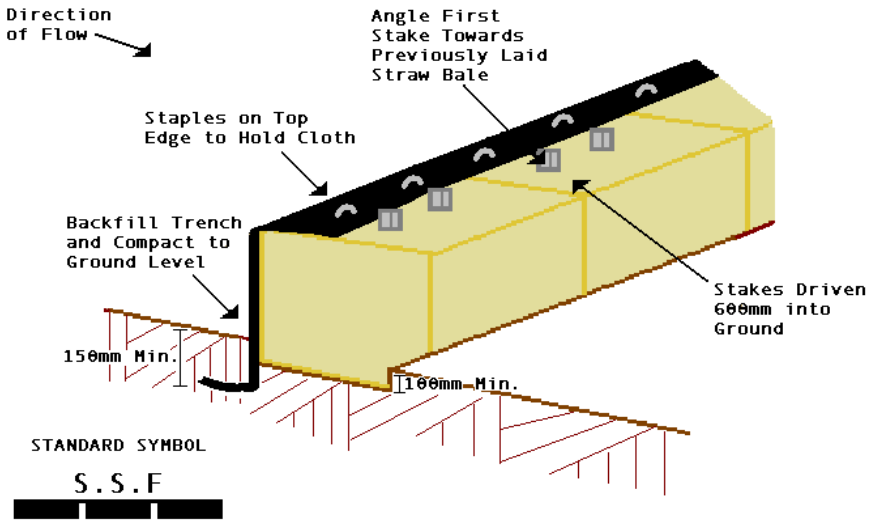
4.1.4 Silt fences including geotextiles



Line of Silt Fence, (ACT 2007, 2004**.)**

Silt fences should not be installed so that run-off can pass around them. Silt fences should be constructed along the contour, with the ends turned up slope to ensure that any build up of run-off behind the fence cannot pass around it.

4.1.5 Straw bale & silt fence

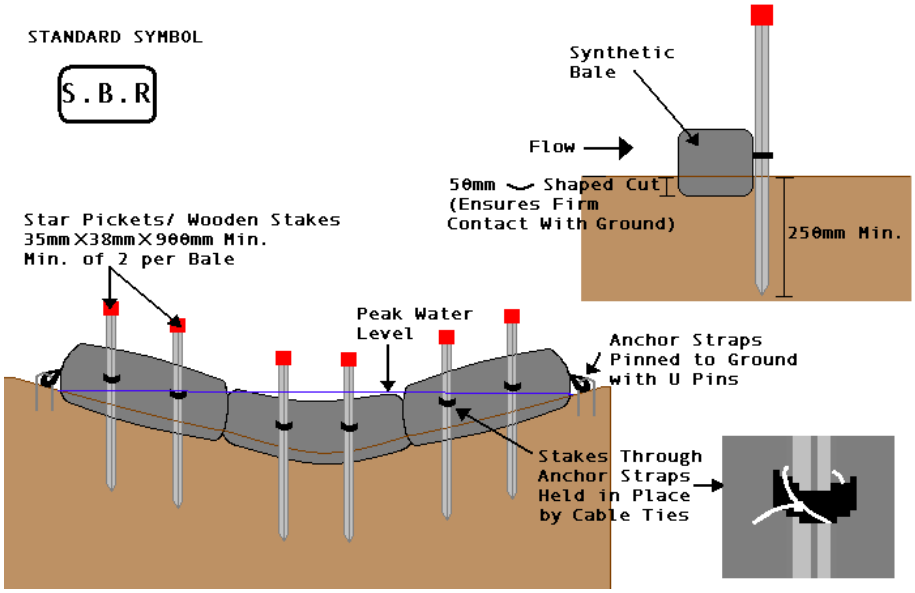


Straw Bale &Silt Fence (Figures from ACT, 1998 and VSAP Building Construction Sites Project Group, 2003)
This combination may be used in an **area of concentrated flow.**

The silt fence should be placed on the up-slope side of the structure.

Replace bales approximately every three months.

4.1.6 Synthetic filters (gravel sausage)

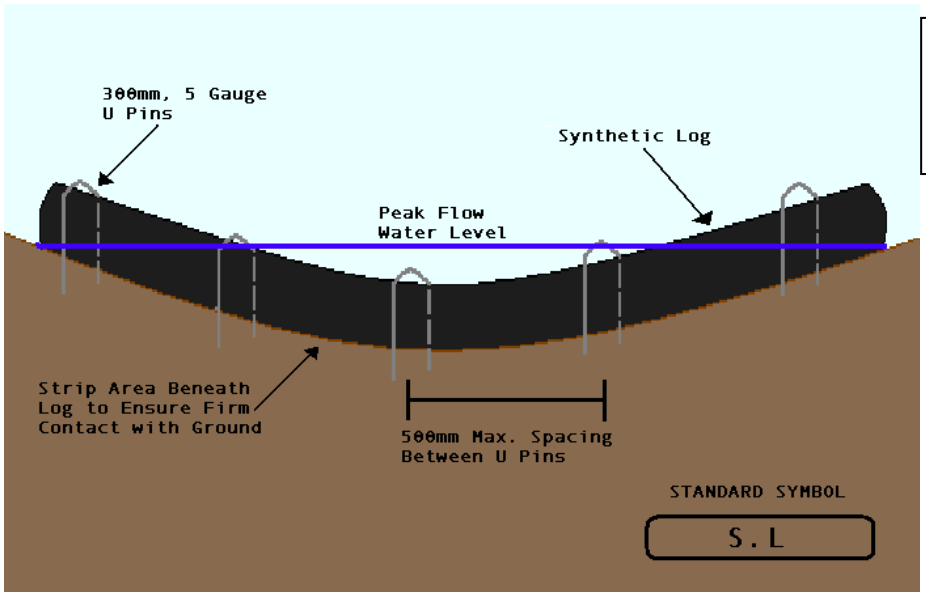


Synthetic filter (Gravel sausage), (EPA, 2004)

These permeable synthetic silt filters consist of a geotextile cover, encasing a synthetic filling. Synthetic filters are effective for removal of coarse sediment and some fine clay.

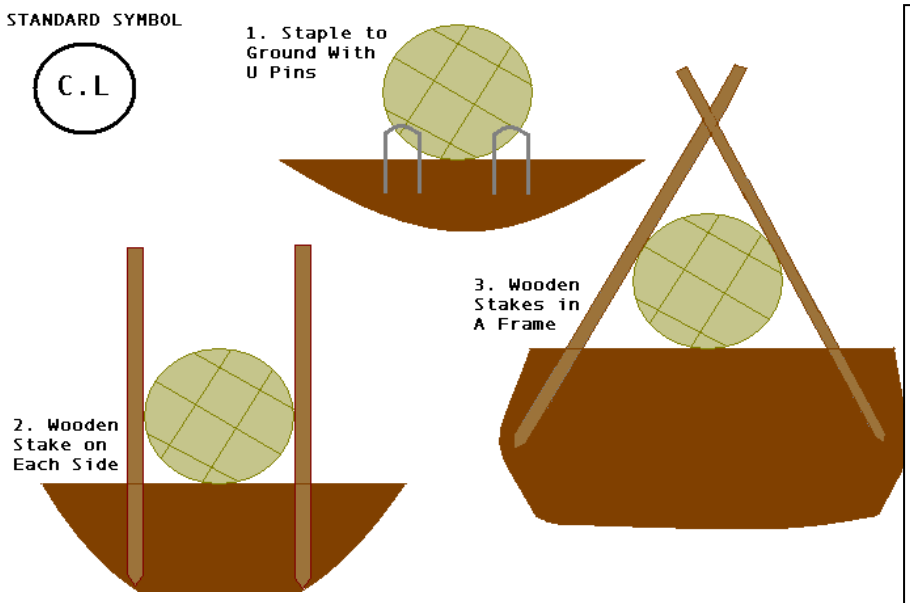
Designs of these products include straw bale replacements and short and long flexible logs.

4.1.7 Synthetic filters (gravel sausage)



Synthetic filter installation, (EPA, 2004)

4.1.8 Biodegradable logs (coir)



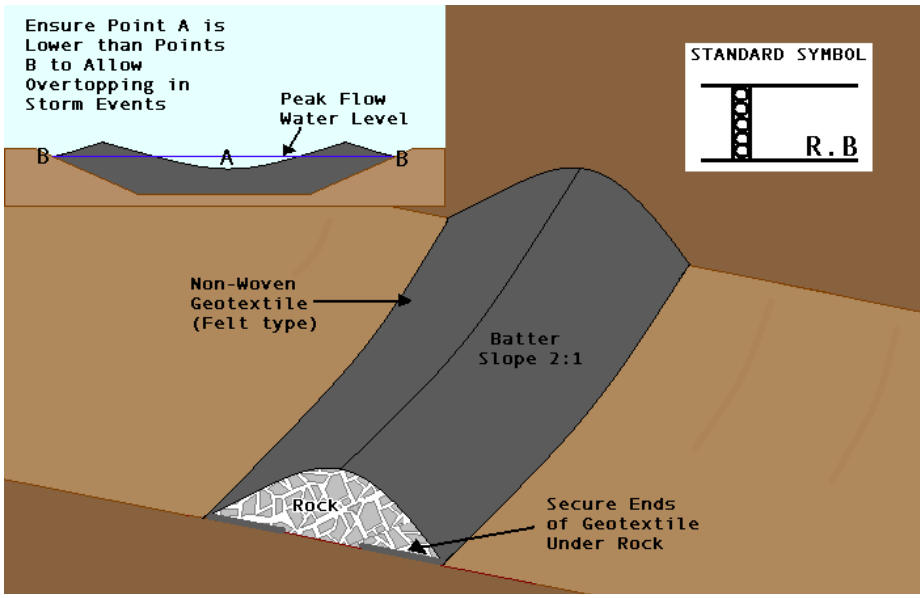
Coir Logs, (EPA, 2004**)**

Compared to straw bales, coir logs are more robust (making them appropriate for use in **concentrated flows**), longer lasting (2-5 years) and weed free. (Treemax, 2001)

The area under the coir log should be stripped prior to placement, to ensure that it can make firm contact with the ground.

Where possible, use pins to secure coir logs as shown in image 4.1.7

4.1.9 Rock bund

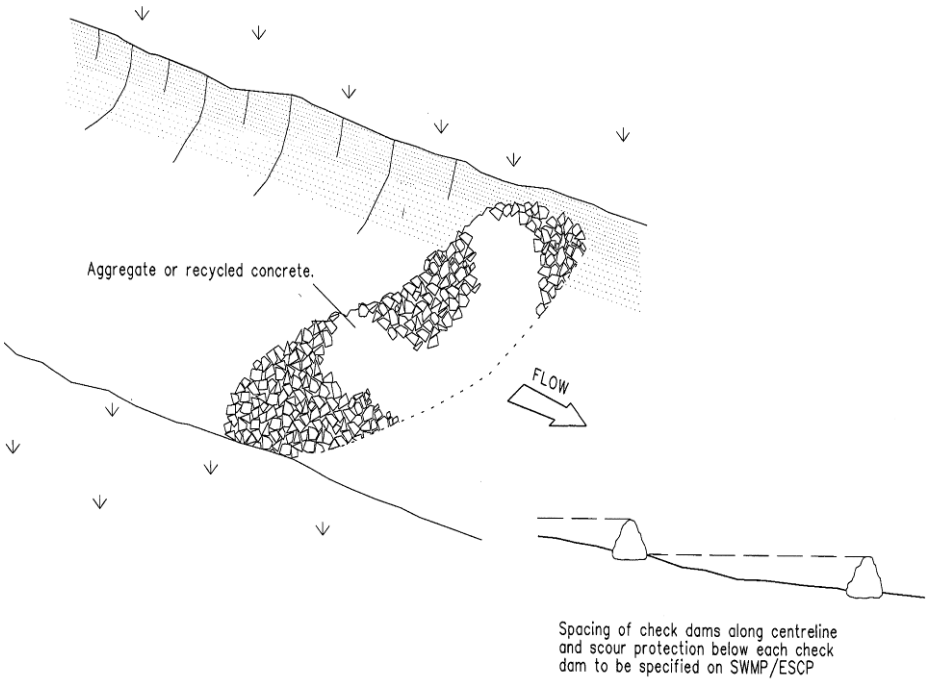


Rock Bund / weir (Figures from ACT, 1998)

Rock bunds consist of non-woven geotextile (felt type), encasing rock. The rock size varies between applications however 100mm rock is effective in many circumstances.

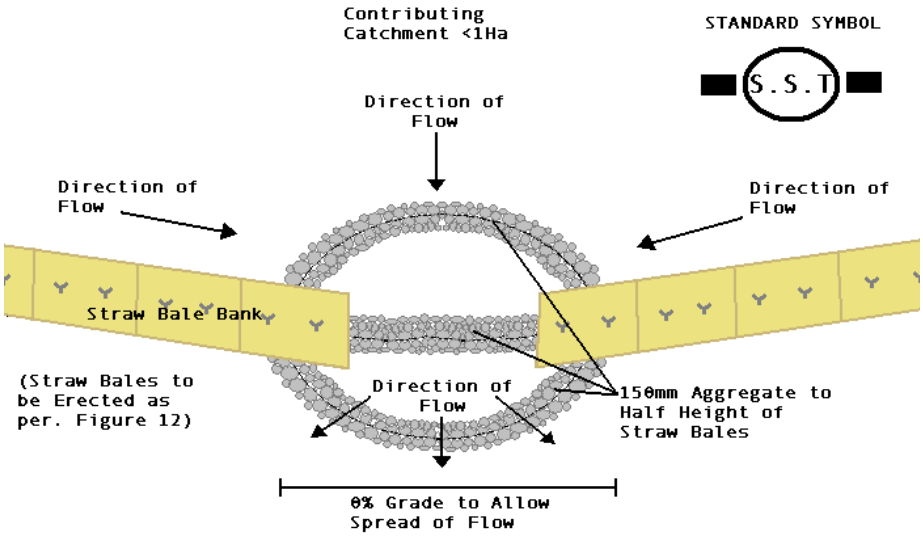
A rock bund should service a catchment no greater than 1Ha (ACT, 1998).

4.1.10 Rock Bund Spacing



Rock Bund Spacing(Figure Courtesy of Landcom)

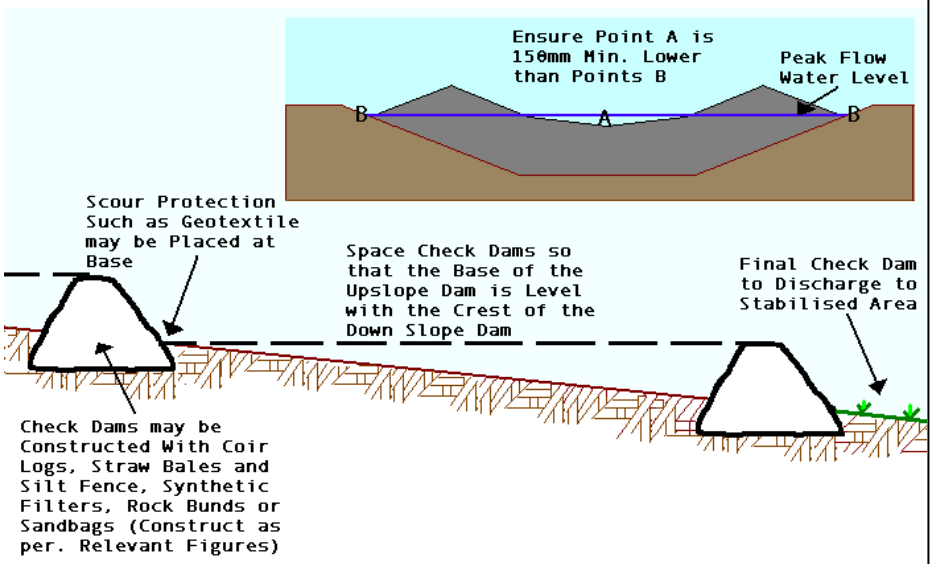
4.1.11 Stone and straw bale sediment trap



Stone & Straw Bale Trap (Figures from ACT, 1998)

Stone & straw bale sediment traps utilise a straw bale bank to divert run-off to be filtered and dispersed by the rock.

4.1.12 Check dams

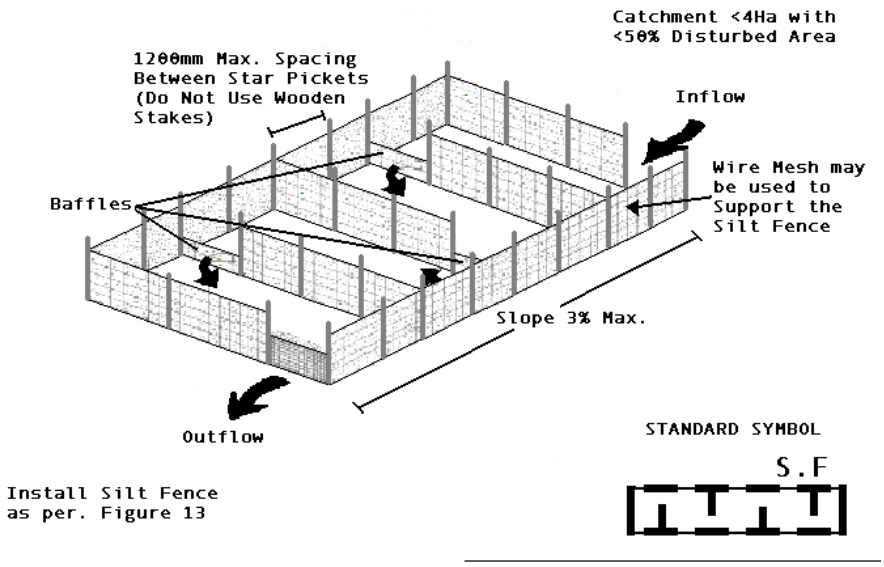


Check Dam (Figures from NSW Dept. of Housing, 1998)

Check dams are generally installed across a channel. They are particularly useful where it is not practical to line the channel. They are also useful for placement in channels that have been seeded, to provide protection until the seed strikes (US EPA, 2003).

Check dams may be constructed with straw bales & silt fence, synthetic logs, biodegradable logs, rock bunds, rock gabions or sandbags.

4.1.13 Silt fence sediment trap



Silt Fence Sediment Trap (Figures from LGPro, 2002)

Silt fence sediment traps slow flow, by increasing travel distance and by placing baffles at opposite ends for inflow and outflow.

5 Stormwater System protection

Flows to stormwater systems from site should filter sediment, while maintaining flow into the drainage system. Maintaining flow is essential, as it prevents flooding and prevents flows further down-slope.

Care must be taken to ensure sediment retention structures do not pose a hazard to traffic, as an obstacle or by creating pondage of water on the road. It is imperative that a bypass into the drainage inlet is maintained in this circumstance, to ensure run-off can enter the inlet in a storm event.

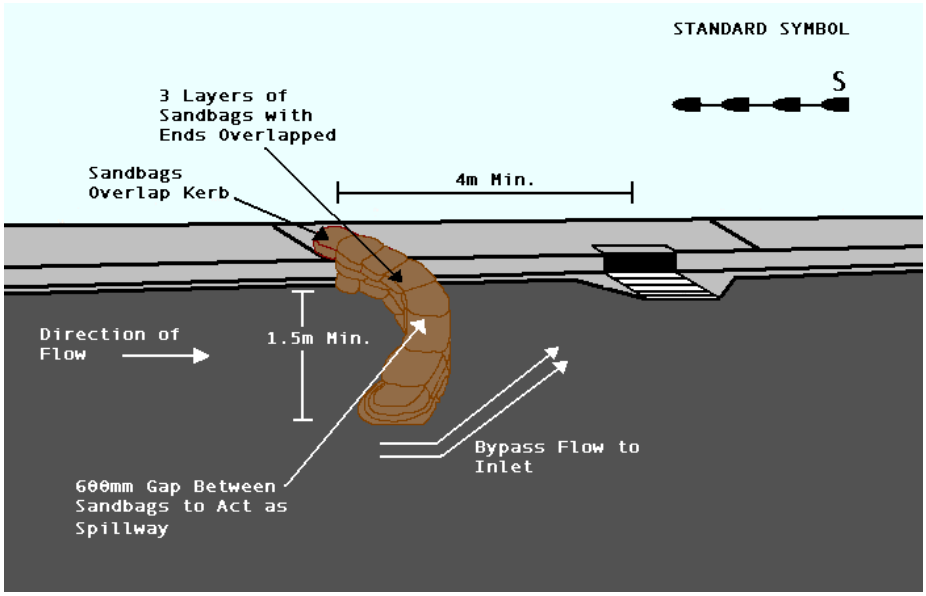
5.1 Sediment control examples – to existing stormwater systems

There are a large number of control methods and devices that will suit most circumstances. Most erosion damage occurs in the initial part of a storm, between 30 minutes and two hours into a storm, and during prolonged storms. Designs of control structures, therefore, need to account for peak run-off flows.

The following diagrams and photographs depict construction examples for sediment control for;

- Roadside stormwater - sandbag sediment barrier 5.1.1 below.
- Roadside stormwater - Gravel/synthetic filter 5.1.2 below.
- Stormwater grate - Silt mesh filter 5.1.3 below.
- Drop inlet - Silt fence/ straw bale filters 5.1.4 below.
- Drop Inlet – Geotextile and sausage filters 5.1.5 below.
- Culvert entry – timber & gravel filter 5.1.6 below.

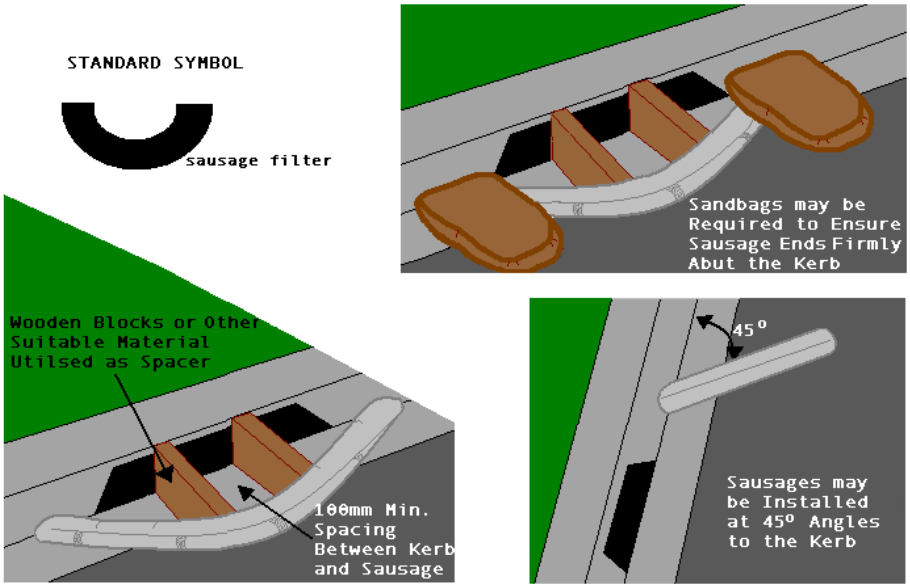
5.1.1 Roadside stormwater - sandbag sediment barrier



Sandbag Sediment Barrier (Figures from LGPro, 2002)

Sandbag sediment barriers are unsuitable controls for trafficked roads as they are an obstruction to vehicles.

5.1.2 Roadside stormwater - gravel/synthetic filter



Roadside stormwater – Gravel/synthetic filter (Figures from VSAP Building Construction Sites Project Group, 2003)

Ensure that a 100mm minimum spacing is maintained between the kerb inlet and the sausage filter. This allows excess run-off to overtop the sausage filter to the drain.

When installing sausage filters at 45 degree angle to the kerb, ensure that they face upstream and that the kerbside end of the sausage is depressed to create a spillway.

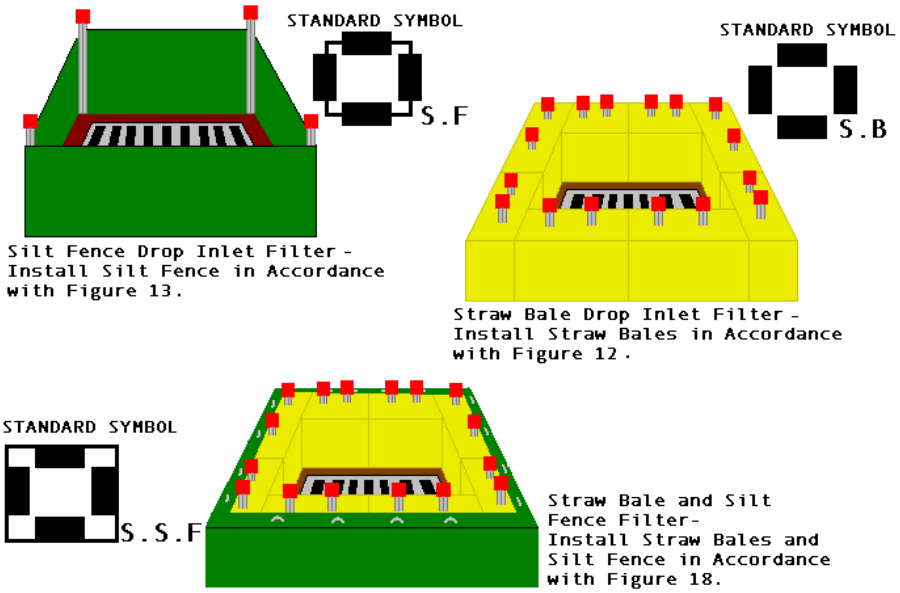
5.1.3 Stormwater grate - silt mesh filter

Stormwater grate - Silt Mesh filter, (EPA, 2004)

This photo shows sediment that has been captured by the mesh filter. Filters with this amount of sediment should be cleaned out.

This measure is best with the mesh on top of the grate rather than below.

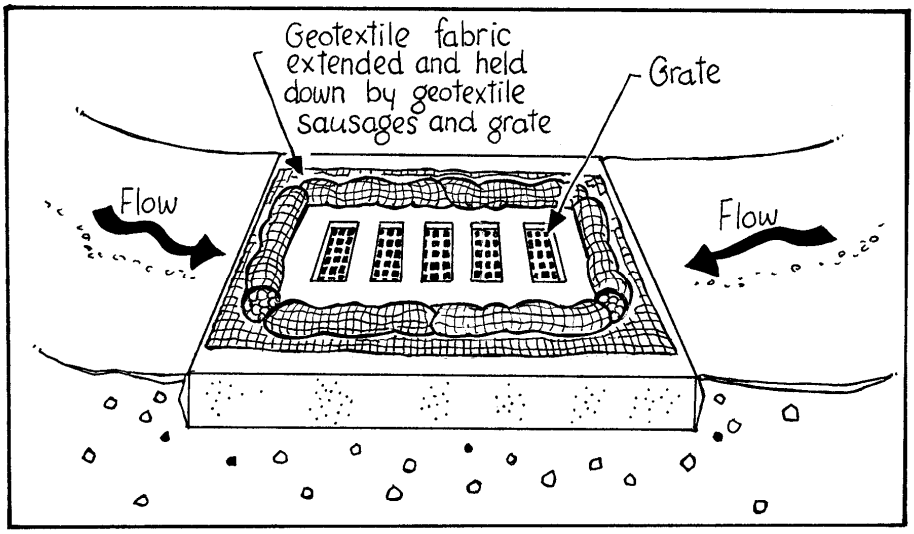
5.1.4 Drop inlet - silt fence/ straw bale filters



Drop Inlet - Silt Fence & Straw Bale Filters, (EPA, 2004.)
straw bales and silt fence should be used when high flows are anticipated. High flows can knock over weaker silt fence structures. Silt fence and straw bales will give best filtration, however ponding may occur.

See above for correct installation of silt fences "Silt fences including geotextiles"

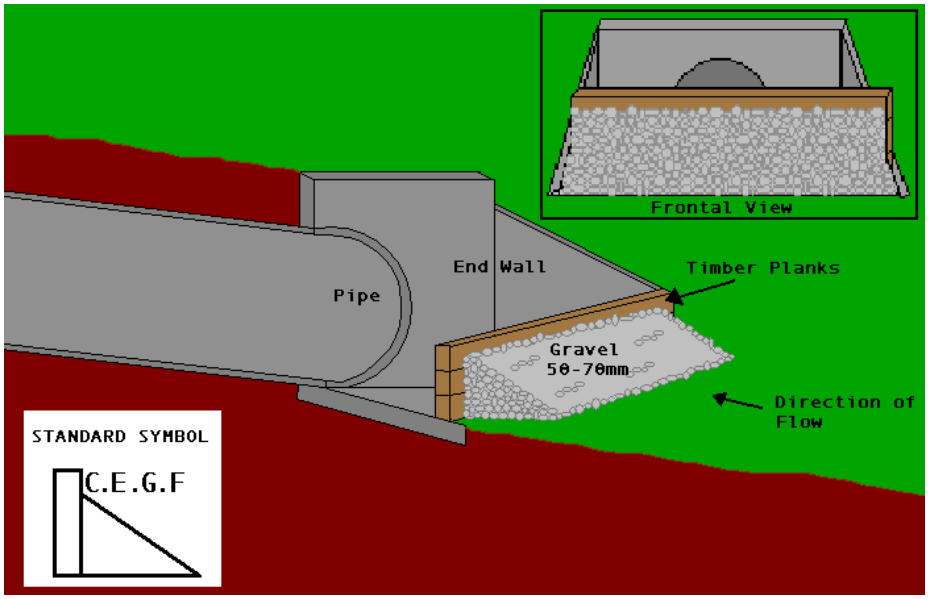
5.1.5 Drop inlet - Geotextile and sausage filters



Drop Inlet – Geotextile and sausage filter (ACT, 2007)

Suitable for areas with low flows of water.

5.1.6 Culvert entry – timber & gravel filter (section diagram)



Culvert Entry – Timber & Gravel Filter (Figures from ACT, 1998)

Timber planks and gravel may be used as a filter to a culvert entry point.

6 Ponds / Basins to contain sediment

Sediment detention dams, ponds or basins hold sediment-contaminated run-off long enough for suspended sediment to settle out. Clarified water can then be discharged to stream.

6.1 Sediment basin size

Ideally a qualified professional should design sediment basins, however the following guidance may be used to design temporary sediment basins to be utilised during the construction phase on site. It should be noted that the following methodology assumes ideal settling conditions, which rarely occurs in practice (Stormwater Committee, 1999). Therefore the sizing determined should be considered the minimum for constructing a basin on site.

The VicRoads temporary sediment basin tool may be used to estimate the size of the sediment basin required. Go to the CCF Victoria website,
http://www.civilcontractors.com/victoria/environment/proceduresguidelines/
then click **sediment basins** near the bottom of the page. This will take you to the VicRoads Website. Click on Sediment basins to open the spreadsheet.

Permanent structures that will provide ongoing sediment control, after a site has been rehabilitated, should be designed using a **50year-recurrence interval**. Examples of permanent structures are wetlands and major sediment detention dams.

Temporary sediment control structures should be designed to take predicted flows, based on a **one-in-two-year storm** (two-year ARI with intensity for six hours) and sub-catchment areas, while contingency plans should be in place to account for extreme storm events. (EPA, 2004)

6.2 Sediment basin depth

The depth of a sediment Basin should be between **900mm and 2m** (NSW Dept of Housing, 1998) and (Melbourne Water, 2002).

When determining depth of a sediment basin the following should be taken into consideration:

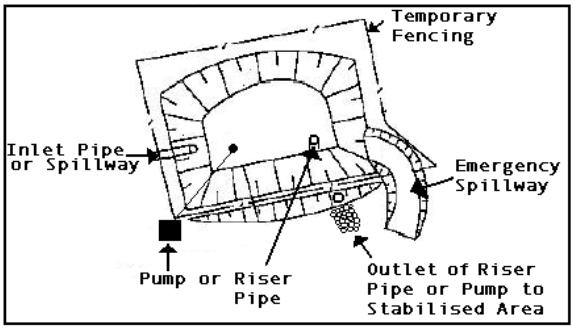
- Safety - shallower basins should be constructed if the basin is located in an area accessible to the public. It may also be necessary to fence the basin, provide gently sloping batters and/or construct benches within the basin.
- Maintenance- sediment basins should be de-silted when the capacity of the basin has been diminished by a third as a result of sediment deposition. Shallower basins will require a greater frequency of de-silting.

Where site constraints do not allow for an appropriately sized basin, baffles may be installed to create an extended, meandering flow path through the basin. Baffles can also prove useful in basins where the inlet and outlet of the basin is in close proximity. (EPA, 2004)

6.2.1 Sediment basin types include:

- Rock sediment basins - rock encased by geotextile is utilised as the basin wall.
- Gabion sediment basins - gabions (rock encased in wire) are used to construct the basin wall.
- Earth basin 6.2.2 below. The basin wall consists of compacted earth. Flows out of the pond are through a riser pipe that allows the basin to be emptied. This basin is preferred as it allows outflow from the pond to be controlled. Water may be emptied from the pond when it meets with legislative water quality parameters. Discharge from the pond can be halted by capping the end of the pipe when it does not.
- Earth basin (wet) - as with dry earth basins the basin wall consists of compacted earth. Flow out of the pond occurs during rainfall events, when the basin overflows via a spillway. (EPA,2004).

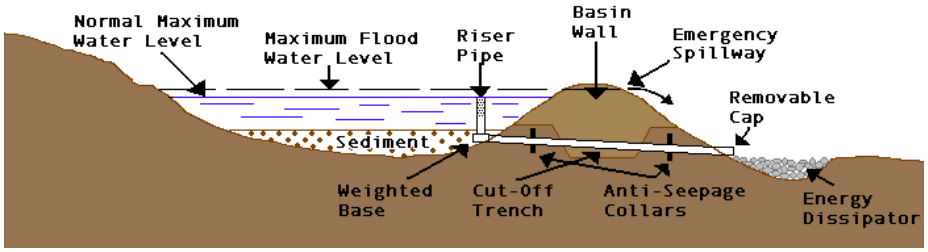
6.2.2 Sediment Basin



STANDARD SYMBOL

SB

Sediment Basin (Figures from EPA Victoria Publication275and ACT, 1998)



7 Flocculent use to Remove Contamination From Water in Ponds

Fine clays suspended in run-off require a long time to settle, often exceeding the economic or practical detention storage capacity. Flocculants may be needed to settle the clays more quickly. Care must be taken not to overdose with flocculent. Excess flocculent degrades water quality and/ or the aquatic habitat in natural waterways.

Although other settling agents exist, including ferric chloride, ferric sulfate, polyelectrolytes and common salt, only gypsum and alum will be discussed here (NSW Dept of Housing, 2003). Other flocculants are not discussed due to their high environmental impacts and/or difficulty of use. **It is strongly advised that gypsum be used** in preference to alum, as it is easier to use and has less chance of having detrimental environmental impacts.

- Gypsum is an effective flocculent comprising of calcium sulfate. Gypsum has limited effect on pH; however its use can result in a slight rise in salinity levels.
- Alum, consisting of aluminium sulfate, produces a faster rate of flocculation than gypsum. However, potential environmental impacts are greater with the use of alum in comparison to gypsum. Vigilance is necessary to ensure overdosing does not occur, as this will result in the pH being lowered. Likely toxic impacts on ecology occur at pH levels less than 5.5 due to a release of dissolved aluminium (NSW Dept of Housing, 1998). Alum should not be used in waters with a pH less than 5.5 or where dosing has the potential to lower the pH to less than 5.5. Accurate pH testing pre-dosing and post-dosing is essential when using alum.
- The use of flocculants should be minimized where water is to be discharged into a contained waterbody, such as a lake or wetland, due to the potential to become concentrated leading to adverse environmental impacts.

7.1 Using flocculent - suggested method of dosing

The methodology of dosing waters with alum or gypsum is essentially the same. When flocculating ponded water on site, ensure that the following points are followed:

- Undertake pre-dosing pH testing to ensure that the selected flocculent will not have adverse effects on the environment.
- Dosing may be undertaken on site by hand by throwing handfuls of flocculent across the ponded water. For the flocculent to work effectively it must be spread over the entire surface of the ponded water (NSW Dept of Housing, 2003).
- Dose rate (always check the dose rate with your supplier)

  Gypsum: 32 kg/100 $m^{2\ for}$ a settling time of 36-72 hrs

  Alum: 1.5-8 kg/ 100 m^2 for a settling time of 24 hrs.
- For larger areas of ponded water where dosing by hand is impractical it may be

necessary to spray the flocculent in a slurry form over the pond with a pump.

- The ponded water must remain relatively undisturbed to provide ideal conditions for settling. As a minimum ensure that the ponded water is undisturbed by inflow from pumps or further run-off from storm events for a period of 24 hours.
- Water quality should be tested prior to discharge to ensure turbidity and pH levels are in line with legislative requirements.

8 De-watering Work Sites

After rain, pooled water is often pumped offsite. Often this water is contaminated with suspended sediment so it is essential that its disposal should not contribute to water pollution.

Treatment is required before discharging runoff to a natural waterway or stormwater system, where turbidity exceeds 30 NTU (Nephelometric Turbidity Units) and is higher than upstream measurements. Hourly measurements of discharge water quality should be taken.

8.1 Determine if water can be reused on site

Re-use of water on site should always take priority over discharge because:

- Discharge to waterways can be harmful.
- Water, particularly drinking water, is a scarce and valuable resource.
- Using reclaimed water as opposed to buying water will save money.

8.1.1 Water may be re-used for

- Dust suppression and.
- Irrigation of vegetation.

8.2 De-watering - suggested measures

- The pump intake should be kept as close to the surface of pool as possible. Floating intakes should be used when the depth of water is sufficient. Care must be taken to avoid pumping from the bottom of ponds, and constant supervision is required during pumping operations to ensure this does not happen.
- The method of pumping should not stir up sediment into the discharged water at the inlet or outlet of the pump.
- The direct discharge of water into a waterway or drainage line should be avoided. Water should be directed to vegetated areas. Precautions should be made to ensure that such areas don't become waterlogged and have adequate capacity to effectively remove suspended solids.
- Pumping to natural waterways should be supervised. Ensure that the level of suspended solids in waters pumped into natural waterways never exceeds the regulatory water quality standard.
- In urban areas it may be possible to discharge contaminated run-off to sewers. Such a

discharge will require approval of the relevant sewerage authority. This option is of limited usefulness as dewatering the site will usually be required during or immediately after rainfall, when the sewers may also be near capacity and unable to accept any additional volume.

- Treat contaminated water pumped into the stormwater system or a natural waterway to remove sediment if the turbidity exceeds 30 NTU. The exception is where the receiving waters has a turbidity of less than 30 NTU (for example surface waters in less developed areas). In this circumstance a higher level of treatment is required to ensure the protection of surface waters as specified in State Environment Protection Policy (Waters of Victoria).
- Monitor every hour during a pumping operation the turbidity of water pumped directly to a natural waterway or a drainage system discharging to a natural waterway.

9 Waterways and Floodplains protection

The responsible authority must be consulted if there are any works that will impact on a waterway. Responsible authorities would include Melbourne Water, Local Councils and CMA's (Catchment Management Authorities). Changes to the physical nature of a waterway require prior approval from the responsible authority.

At the design stage, consider all options to avoid working in a natural waterway.

9.1 Working in and around waterways – suggested measures

- Minimise the time during which work in a waterway is required, and the extent of works.
- Schedule works for the driest months of the year and the lowest flow of the waterway.
- Avoid times of the year when aquatic population may be under stress, such as during migration spawning, or when food may be scarce.
- Establish protocols to minimise downstream damage.
- Stabilise any disturbance to a levee, bank or bed so that erosion and undercutting is avoided.
- Implement measures to ensure that vegetation cover returns to the site as quickly as possible.
- Measure turbidity continuously immediately downstream from the areas in which work is occurring, and modify work practices where continuous monitoring shows degraded water quality.
- If working in a concrete channel, use appropriate machinery to avoid damage to structures.
- Locate stack sites, toilets and servicing facilities in areas where material cannot wash into a waterway.

9.2 Stream crossings – suggested measures

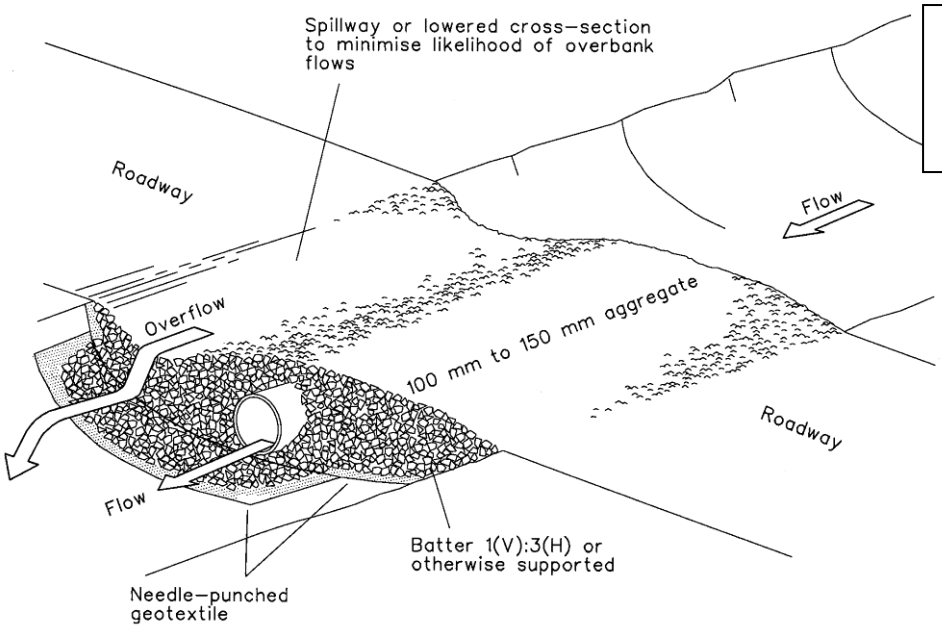
If in-stream activities require construction of a stream crossing, three types of access crossings may be considered.

Culvert: this type of crossing may be effective in controlling erosion while in use, but will cause erosion during installation and removal. In stream controls may be required to ensure that any increased velocity of water flow due to the culvert does not cause scouring of the bed of the waterway.
Ford: this type of crossing may only be used during periods of low flow. A ford is not appropriate if construction will continue during wet periods of the year.
.
Bridge: this type of crossing must be used for major waterways and for other waterways with high flows.

- The crossing should be installed during low-water flows with downstream weirs in place to trap any released sediment.

- The crossing should be protected against erosion, both to prevent excessive sedimentation in the waterway, and to prevent washout of the crossing.
- The crossing should be positioned perpendicular to the flow and located at the narrowest part of the stream.
- Damage to the stream bed and banks should be avoided.
- The crossing should be engineered to be stable under the expected vehicle loads.
- Drainage over the surface of the crossing and access road should have adequate controls to ensure that sediment run-off to the stream is minimised.
- If a cofferdam is used, minimum downstream flows should be maintained that will sustain the aquatic ecology.
- Stream crossings also act as sediment traps. Cleaning sediment out behind a crossing should follow the same procedure as for weirs.

9.2.1 Temporary Waterway Crossing



Temporary Waterway Crossing, (Courtesy of Landcom)

9.3 Contingency planning for working in waterways

Contingency plans should also be in place for intense storm events, particularly where works are planned to occur within a floodplain.

The contingency plan should address:

- The consequences on the environment of 5, 10, 20 and 100-year-frequency floods.
- Methods to limit stormwater entering excavation areas.
- Enhancement of existing measures and installation of additional controls, when an intense storm event is forecast.
- Location of construction facilities.
- Clean-up procedures, including disposal of excess water.
- A flood warning system.
- Procedures for preventing the loss of spoil, fuel, chemicals or other materials that could

adversely affect the environment.
- Notification of relevant authorities if unplanned incidents occur that could pose a risk to the environment.
- Methods for extracting plant and equipment from the works area.

9.4 Waterways reinstatement plan

Prior to works being undertaken on, a reinstatement plan should be prepared and submitted for approval to the responsible authority. The plan should include:

- Proposed changes to the waterway.
- The impact on adjacent vegetation.
- The type and form of flood protection works.
- Erosion, scouring and sediment run-off controls.
- Proposed methods for reinstatement of the waterway bed and banks.
- A revegetation plan addressing a period of no less than 12 months and including proposed species and locations, methods for weed control and ongoing maintenance until a satisfactory level of established plants is achieved.

9.5 In Stream sediment control – suggested measures

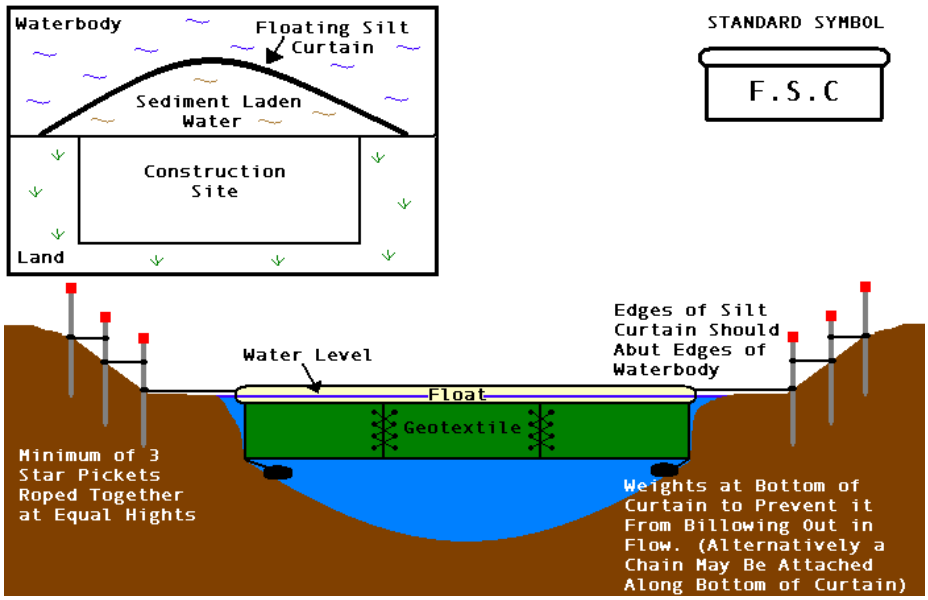
When the site is intersected by a stream, then in-stream controls such as a rock weir are required to reduce water velocity and trap sediment. In stream sediment retention measures should not be relied upon as the sole measure of erosion and sediment management.

- Install erosion and sediment control measures above and within the waterway, before construction commences.
- Design and install appropriate erosion and sediment run-off control measures appropriate to site conditions to handle a one-in-two-year storm event (two-year ART with intensity of six hours), for temporary structures, and a one-in-fifty year storm event, for permanent structures (EPA 2004).
- Establish an adequate inspection, maintenance and cleaning program for sediment run-off control structures. Special precautions should be taken when cleaning behind a weir to ensure that trapped sediment is not resuspended.
- Ensure that contingency plans are in place for unusual storm events.
- Continually assess the effectiveness of sediment control measures and make necessary improvements.

The following measures are shown below;

- Floating silt curtains 9.5.1 below.
- Composite Silt Curtain 9.5.3 below.

9.5.1 Floating silt curtains



Floating Silt Curtain (Figures from NSW Dept. of Housing, 2003),

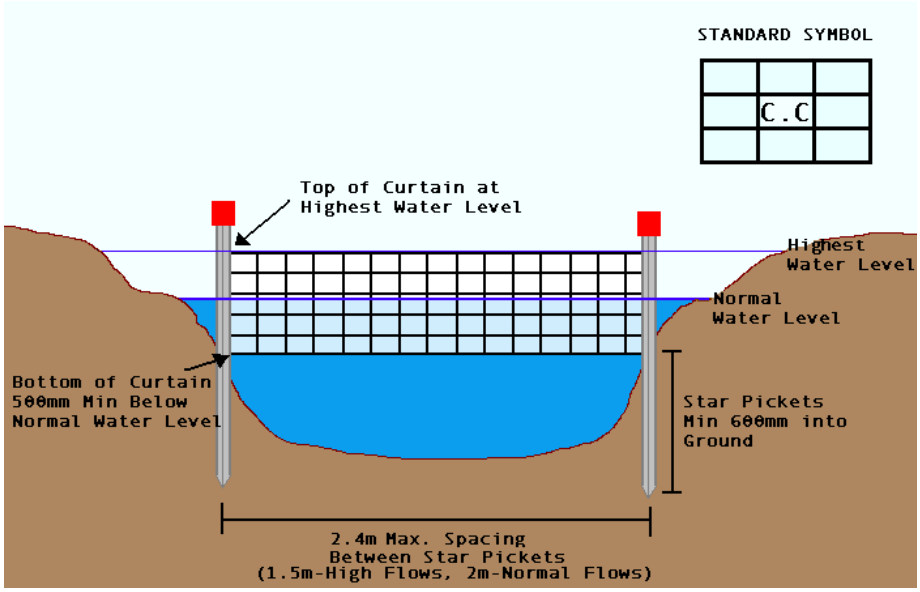
Floating silt curtains consist of a curtain of geotextile that is supported in a water body by floats and weights. They are only suitable for areas of low velocity flows.

When installing floating silt curtains in a channel, ensure that the float width equals the channel width. The geotextile curtain sides should be graduated downwards to match the channel sides. This will inhibit erosion at the sides of the channel.

9.5.2 Floating silt curtains

Floating Silt Curtain (Courtesy of Geofabrics Australasia)

9.5.3 Composite silt curtain

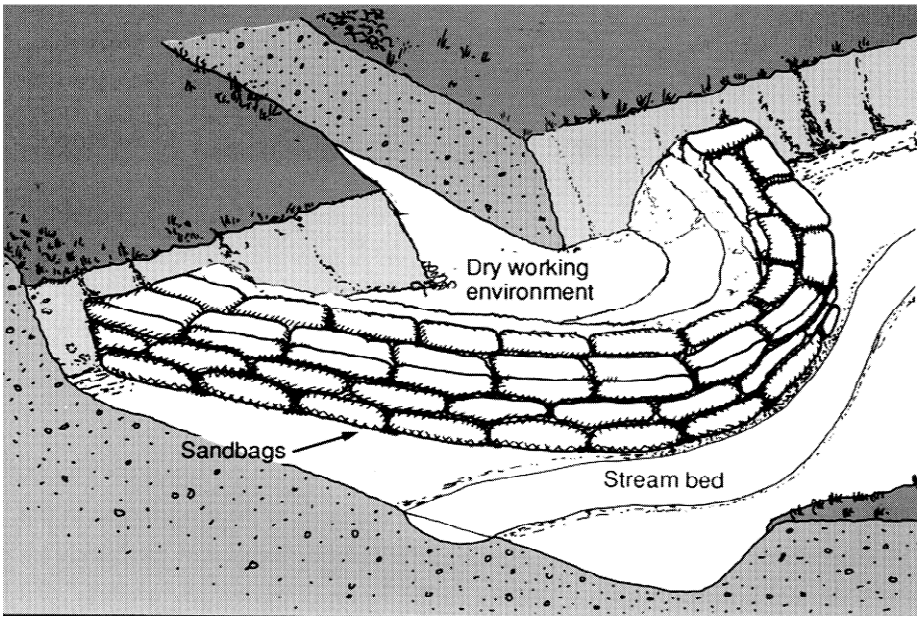


Composite Silt Curtain, (EPA 2004) Composite silt curtains may be constructed of materials such as plastic mesh encasing combed synthetic fibres. A line of composite silt curtain may be installed across a water body.

9.5.4 Composite silt curtain

Composite Silt Curtain, (EPA 2004,) Trapped Sediment Visible on a Composite Silt Curtain (Silt Cell) During Low Flow Conditions

9.5.5 Stream Diversion



Stream Diversion, (ACT, 2007)

9.6 Horizontal Direct Drilling (HDD) near waterways – suggested measures

HDD has a number of issues that have a high level of potential to cause impact to the environment, particularly when the works are done close to a waterway. These include the management of topsoils and subsoils, mud and contaminated water. The underlying geology of a site also has the potential to impact upon ability to drill through a site and the potential for a high level of environmental damage through fracturing.

To mitigate the potential impacts from HDD the following measures should be implemented:

- Underlying geology understood. Look for rock outcrops or sandy soils in the waterway.
- Entry and exit holes (Bellholes) should be constructed away from the bank of the waterway.
- Soil managed as per section 12 below.
- Subsoil from bellholes formed into a Turkey nest (mounded with a crater in the top) to allow for the storage of contaminated water on site.
- The works area to be bunded to prevent the movement of soil and water into the waterway.
- Mud from the bore hole to be kept separate from the other soil.
- All water to be discharged into the turkey nest or other storage facility. No water should be discharged to the immediate environment.

Appendix C
ACOR Detailed Design Drawings

Appendix D
Stubbo Solar Farm Soil and Water Management Monitoring Requirements

Table D - Erosion and Sediment Control Plan: Management and Monitoring Measures

Installation	Potential problems	Performance criteria	Mitigation and control measures	Monitoring requirements	Responsibility	Timing	Frequency
Vegetated buffer zones	Accidental clearance	No unauthorised clearing of vegetation in buffer zones	Revegetate	Check buffer zones for evidence of cleared vegetation	UPC\AC	Duration of construction	Weekly
Other vegetation	Exposure of soil to erosion	Minimise exposed soil areas	Where practicable, vegetation clearing activities should be staged, so that areas of exposed soil are minimised	Check cleared areas for evidence of erosion	UPC\AC	Duration of construction	Weekly
Access tracks and laydown areas	Dust	Dust should not impact off-site receptors	Pave haul roads and other areas with gravel or impervious sealant, wet down tracks on windy days	Inspect the site for dust generation	UPC\AC	Duration of construction	At least daily
	Soil on paved roads	No off-site roads to be contaminated with tracked mud and or dirt	Install wheel wash and rumble grid	Inspect off-site roads for tracked mud and dirt			
			Manually wash vehicle wheels Increase road cleaning frequency				
Stockpiles and bare slopes	Erosion	No sediment-laden stormwater discharged off-site	Minimise exposure to run-off and action of wind and ensure stabilisation measures are effective	Check effectiveness of stabilisation measures	UPC\AC	Duration of construction	Weekly
Drains and waterways	New drainage lines not controlled	No sediment-laden stormwater discharged off-site	Install appropriate sediment controls on new drainage lines	Check drainage lines for sediment controls	UPC\AC	Duration of construction	At least once every two days in areas where earth-moving is occurring. Weekly elsewhere
	Sediment-laden stormwater contamination of waterways	No sediment-laden stormwater discharged off-site	Avoid or control erosion on the site as per the procedures in Section 6	Check for localised erosion on site and rectify as soon as is practicable. Monitor erosion and sediment control measures to ensure they are functioning adequately	UPC\AC	Duration of construction	Once a week (as a minimum) Immediately following rainfall events that cause run-off
			Replace or repair damaged drains, redesign ineffective drains, relocate incorrectly placed drains	Check integrity and effectiveness of drains	UPC\AC	Duration of construction	Weekly
Stream crossings and culverts	Unstable	No unstable crossings	Stop use until installation has been redesigned	Check integrity and stability of stream crossings	UPC\AC	Duration of construction	When in use, but no less than weekly
Settlement basins, bunds, sediment fences, filters and screens	Sediments not effectively removed	No sediment-laden stormwater discharged off-site	Maintain the effectiveness of control measures as per the procedures in Section 6	Monitor sediment levels in water holding areas and sediment fencing, check for integrity of bunds and other control structures	UPC\AC	Duration of construction	Once a week (as a minimum) Immediately following rainfall events that cause run-off
			Sediment and erosion controls take many forms and one or a combination of controls may be appropriate for a given circumstance. The management controls should be in accordance with the measures described in *Managing Urban Stormwater: Soils and Construction*				
			Any excess contaminated stormwater and process waste water that cannot be reused on-site will be disposed of in accordance with the *Managing Urban Stormwater: Soils and Construction*	Undertake visual inspections for turbidity downstream of any discharge points	UPC\AC	Duration of construction	Hourly when discharging
Chemical storage areas	Spills and contamination	No release of fuels or chemicals to land or water	Locate storage and refuelling areas 50m from sensitive area such as waterways, wetlands and native vegetation	Check location for distances	UPC\AC	Prior to construction	As necessary
			In the event of discovery of contaminants, stop work, remediate and dispose of contaminants as necessary	Inspect the site for contamination	UPC\AC	Duration of construction	Continual
			Maintenance and refuelling areas adequately bunded	Check integrity and adequacy of bunding	UPC\AC	Duration of construction	Weekly

Table D - Erosion and Sediment Control Plan: Management and Monitoring Measures

Placement of infrastructue	Infrastructure impacts stream	No infrastructure to be placed within 20 m of any Strahler 3 or above order streams	Ensure infrastructure is placed at 20 m or greater from any Strahler 3 or above order streams	Check location for distances	UPC\AC	Prior to construction	As necessary
'No go' zones for construction plant and equipment	Increase to erosion and sediment loss	No unauthorised use of no-go zones	Ensure 'no go' zones for construction plant and equipment are in place	Check no-go zones for signage, barriers and unautrhorised vehicles and/or plant	UPC\AC	Duration of construction	Continual

Appendix E
Consultation Register

ACEN

Stubbo Solar Farm - Consultation Register						
Entity	Date	Type of contact	Contact name	Topic of engagement	Details	Agreed outcome(s)
ACEN	mid July 2022	Email	Cedric Berge	Review of Soil & Water Management Plan	ACEN provided the Soil & Water Management Plan to DPE for comment	DPE to provide comment
DPE	31-Aug-22	Email	Jeremy Morice	Review of Soil & Water Management Plan	DPE provided comment on the Soil & Water Management Plan	Comments incorporated into a revised version of the paln (v3)